

Determinants of Consumer Purchase Decision for Dragon Fruit and Guava and Implications for Value Chain Improvement

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Growing attention has been paid to the consumption of dragon fruit (*Hylocereus* spp.) and guava (*Psidium guajava* L. 'Queso de Bola'), which are among the emerging fruits that have large economic potentials due to increasing popularity and demand. This study provided an understanding of the factors influencing consumer purchase decision from 200 respondents as affected by preferences and demographic characteristics. Results showed that Filipino urban consumers still put greater value on intrinsic attributes including freshness, peel color, overall peel quality, and taste. Strong correlations to household conditions implied that as income increases and/or household size becomes bigger, consumers were more active in purchase decision processes. Consumer segments identified health-conscious and convenience-inclined groups as less sensitive to price changes whereas aesthetic-conscious/price-sensitive groups paid more attention to visual quality attributes while being price-conscious. However, purchase disappointments signaled a possible mismatch in production and consumption thus improvements along the value chain starting from production, postharvest handling, and marketing, as well as concomitant priority

research areas, can be made to capture consumer preferences. Consequently, this would translate to increased market demand from satisfied consumers, reduced losses, and chain efficiency that could propel the development of the emerging fruit industries.

KEYWORDS

consumer preference, dragon fruit, guava, correlation, consumer segments, value chain improvement

INTRODUCTION

The Philippine fruit retail industry, which is growing at a significant rate, is transforming its retail formats into modern ones and fundamentally alters consumer accessibility to various fruit crops (Romo and Digal, 2009). As an effect, it has altered consumer choices for fruit consumption (Florkowski, 2018). While major fruits dominate retail markets, other fruit crops, such as dragon fruit and guava, are starting to emerge especially in modern retail marketplaces in urban centers.

Dragon fruit (*Hylocereus* spp.), an introduced crop in the Philippines that used to be cultivated in backyards, has now emerged into a lucrative industry (Eusebio and Alaban, 2018). Aside from being a health food, it is also a profitable crop and

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has been tagged by the Department of Agriculture-Bureau of Agricultural Research (DA-BAR) as new money crop or revenue earner for farmers (Reynoso, 2012). On the other hand, guava (*Psidium guajava* L. 'Queso de Bola') is a fruit extensively planted in small non-contiguous areas, remains to be underutilized, and often relegated as a backyard crop (Rodeo et al., 2018). Due to their growing popularity and demand, these novel fruits are believed to have large economic potentials due to nutritional and health benefits. For the past 5 years, there have been increasing trends in both production and consumption of the fruits (Tepora, 2019; BPI, 2019). Supply is increasing while potential markets are expanding, including exports. In addition, both crops were identified by the Department of Agriculture as priority crops for development.

In a consumer-driven food marketplace, success or failure of marketing different food products is often influenced by the food decision making processes of the consumers (Sloan, 1994). Several studies indicated the power of consumers in the purchase and consumption of food products, especially on fruit consumption in recent years. Some attributed consumers' attitude to diverse determinants or sets of choices and deciding factors (Kuhar and Juvancic, 2005) and are identified as motives behind the consumption.

Studies suggest that the motivation to purchase fruits are derived from health and nutritional concerns (Haghiri et al., 2009), interests in organically produced fruit crops (Yiridoe et al., 2005; Owusu and Anifori 2013), safety and quality concerns (Harker et al., 2008; Causse et al., 2010; Moser et al., 2011), preference of minimally-processed fruits (Ragaert et al., 2004), and impacts of demographic and behavioral characteristics (Gao et al., 2011). Several established and emerging food consumption trends, as identified by Sloan (1994, 1996, 1998), affected food decisions individuals make. These factors shaped consumers' preferences, and currently, producers respond mainly to these preferences as reflected in the supply of different types of fruits in large retail outlets (Florkowski, 2018).

The increasing trend in fruit demand worldwide due to consumers growing consciousness for healthy lifestyle does not guarantee the sustainability of any fruit industry. It is important to note that consumer preferences and consumption patterns have also been greatly influenced by lifestyle changes brought about by industrialization, urbanization, globalization, changes in work patterns and participation of women in the workforce (Goletti and Samman, 2000; Rolle, 2003). As Badar et al. (2015) cited, 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. Thus, identifying consumer segments is equally important as that of determining quality requirements.

Hence, there is a need to identify the determinants of consumer purchase decision for dragon fruit and guava in urban and peri-urban areas as affected by their preferences and individual socio-economic background. The study aimed to determine consumption patterns and behavior, correlate demographic factors and quality attribute preferences and identify consumer segments for market positioning. Translating consumer preferences for value chain improvement will bring about increased customer satisfaction and chain efficiency that can help minimize product losses, increase profits of chain actors, and propel the development and sustainability of the identified fruit crop industries.

MATERIALS AND METHODS

Data Collection and Survey Instrument

The data used in this study were drawn from responses to a survey instrument via purposive sampling. Based from the initial value chain mapping done on dragon fruit and guava, majority of the fruits were distributed in market centers in NCR and CALABARZON regions where major consumption took place. Surveys were administered in these areas including various institutions and residential estates from these regions. The National Capital Region (NCR) is a densely populous area where major market centers are situated including popular fruit marketplaces such as Divisoria and Blumentritt wholesale and retail markets. Situated 30 to 80 kilometers away from NCR are marketplaces in CALABARZON region such as Mahogany public market in Cavite and Tanauan wholesale market in Batangas where consumer surveys were also conducted. From the number of survey questionnaires retrieved, 200 sample respondents (n=100 for dragon fruit and n=100 for guava) were purposively selected based on the following criteria: (1) purchase and consumption of dragon fruit and guava took place for the past 12 months; (2) respondent is a resident from NCR or CALABARZON.

Structured survey questionnaires were designed to analyze consumers' preferences and attitudes toward dragon fruit and guava. Survey questions 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. The first section of the survey dealt in evaluating consumer's purchase behavior and attitudes toward the identified fruit crops. Focus of the empirical scrutiny was given in identifying the determinants that influence their purchase frequency and decisions in buying and consuming the fruit. Socio-demographic profiles of the consumers were included in the second section of the survey.

Data Analysis

The consumer data were tabulated and discussed in terms of socio-demographic characteristics (sex, civil status, age group, level of education, household size and income level, place of residence), consumption behavior and attitudes, and quality attribute preferences for dragon fruit and guava. Radar charts (spider-web diagrams) are used to illustrate attribute preferences for both fruits. While consumer profiles and attitudes were independent of each other, comparing these behaviors can be evaluated via qualitative comparative analysis (QCA). This assumes that a constellation of factors (independent variables) result in a certain outcome (dependent variable) and that different constellations (paths) may yield the same outcome (Esser and Vliegthart, 2017). This approach aided in identifying prevailing consumption patterns, food habits and trends for both fruit crops.

The relationship of the socio-demographic characteristics and quality attribute preferences was determined using the Spearman's rank order correlation. The analysis assessed the strength and direction of association between the variables and identified their significance that relate to or affect consumer attribute preferences. In attempting to compare the correlations for both fruits, the comparison of relationships was evaluated. The comparison of contexts served as a robustness check in determining whether a relationship holds for both situations.

In identifying market segments, clustering analysis via *k*-means clustering method was generated from the statistical software. Demographic and behavioral characteristics that represent an identified segment were determined. While segments comprise

Table 1: Profile of dragon fruit and guava consumers, 200 respondents, 2017

Socio-demographic Characteristics	Respondents (%)		
	Dragon Fruit (n=100)	Guava (n=100)	Total (n=200)
Sex			
Male	36.0	29.0	32.5
Female	64.0	71.0	67.5
Civil Status			
Single	48.0	46.0	47.0
Married	46.0	45.0	45.5
Widowed/Separated	6.0	9.0	7.5
Age			
20 years old and below	4.0	5.0	4.5
21 to 40 years old	66.0	55.0	60.5
41 to 60 years old	26.0	34.0	30.0
61 years old and above	4.0	6.0	5.0
Educational Attainment			
Elementary	1.0	1.0	1.0
High School	16.0	25.0	20.5
College	70.0	51.0	60.5
Graduate	13.0	23.0	18.0
Household Income ^a			
150,000 and below	31.0	43.0	37.0
150,001 to 250,000	26.0	16.0	21.0
250,001 to 500,000	25.0	19.0	22.0
500,001 and above	18.0	22.0	20.0
Household Size			
Small (4 members and below)	54.0	52.0	53.0
Medium (5 to 7 members)	36.0	39.0	37.5
Large (8 members and above)	10.0	9.0	9.5
Place of Residence			
NCR	44.0	28.0	28.5
CALABARZON	56.0	72.0	56.0

^a in Philippine Peso (PhP); Exchange rate: US\$ 1.00 = PhP 50.28 (December 2017)

consumers sharing similar product needs and characteristics within the group, explaining different relationships across units was also considered. The approach used in comparing segments between fruits was best described via comparative explanatory analysis.

All other statistical tests were analyzed and generated using IBM® SPSS version 23.

RESULTS AND DISCUSSION

Consumer Characteristics

The heterogeneous or undifferentiated markets for dragon fruit and guava were composed of consumers with varying socio-demographic characteristics. Table 1 showed that majority of respondents comprising the total market for dragon fruit were females (64%) belonging to a younger age group of 21 to 40 years old (66%) and with college education (70%). For guava, the total market was also represented mostly by females (71%) in the younger age group (55%) having college education (51%). In terms of household profile for both fruits, it would appear that the ratio of single and married respondents were proportionately distributed among all income levels. Households were described as a small size consisting of 4 members and below. From the consumer profiles, results would indicate that both fruits appeal to relatively younger generations with higher level of education, and with a small household size.

Consumption Patterns and Behavior

The factors affecting the buying habits and decisions of consumer-respondents of dragon fruit and guava, influence of market outlet choice, quality attributes, and barriers related to these attributes explained consumption patterns and behavior towards each fruit.

Factors affecting buying habits and decisions

Factors affecting consumer decisions can be explained by influences that drive an individual consumer to make purchases. These influences were either classified as person-specific, social, lifestyle, or psychological influences. For both fruits, the strongest determinant in explaining how they make buying decisions was their lifestyle. Due to consumers' growing awareness concerning health issues, the health and nutritional attributes of both fruit crops were perceived as the most significant reason in buying dragon fruit (94%) and guava (64%) (Figure 1). According to Moser et al. (2011), perceived personal health-related differences in consumption can be linked to the presence of nutritional components such as vitamins. This shows a pattern of increasing consciousness of urban dwellers in the Philippines to include fruits in their diets for a healthy lifestyle. Other major influences were related mostly to person-specific, social, and psychological influences. Person-specific influence is described by situational factors or the set of conditions existing when an individual makes a purchase. Among the major reasons as to why consumers engage in buying the fruits were the need to satisfy craving and market availability. This was

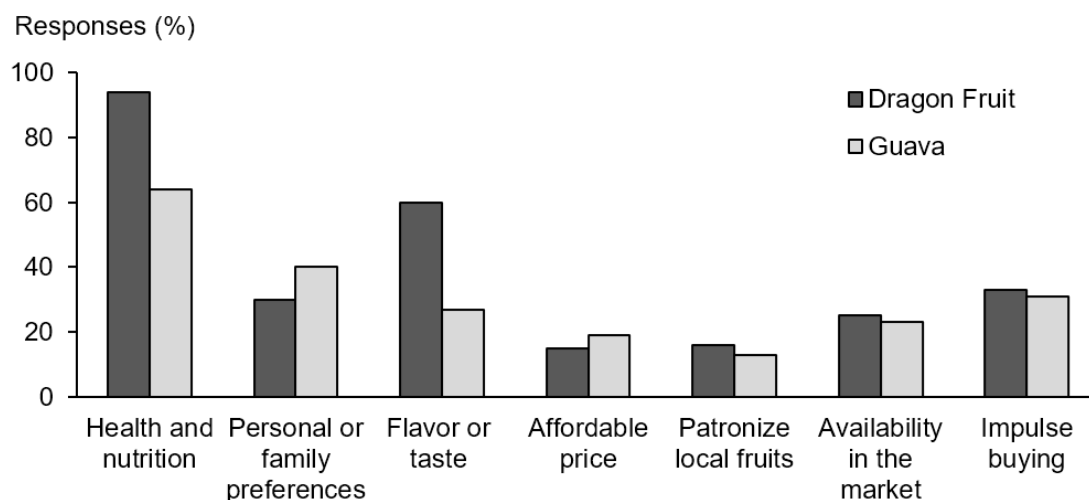


Figure 1: Reasons for purchasing the fruit, dragon fruit (n=100) and guava (n=100 respondents), 2017



Figure 2: Types of market outlet choice, dragon fruit (n=100) and guava (n=100) respondents, 2017

explained by the considerable proportion of respondents who attributed their purchase on the deciding condition that whenever they feel like eating dragon fruit and/or guava, they must also be readily available in marketplaces. Social influences such as family preferences can also induce individuals to buy dragon fruit (30%) and guava (40%). To illustrate, a consumer is influenced by household purchase decisions and preferences making him/her also involved in the purchase of fruits. Consequently, psychological influences such as perception or sensory factors associated to eating experience components were among the valued reasons for buying dragon fruit (60%) and guava (27%). Flavor or taste is one of the components of experiential eating quality of the fruit since they represent the basic components of eating pleasure (Tan, 2000; Ernst et al., 2006). Least relevant factors to buying decisions were affordability and the preference for locally-grown fruits over imported ones that are available in the market. Patronizing local fruits was usually attached to the social responsibility of consumers when they buy the fruit in order to support local farmers.

Market outlet choice and purchasing patterns

Consumption of the fruits was also influenced by their accessibility. The wide variety of fruits that were consumed is oftentimes reflected by their source, that is, from small scale backyard plots for households to commercially grown fruits for large scale consumption. However, the seasonality of domestic production and the need for imports in the effort to assure year-round accessibility affected consumption of dragon fruit and guava. Due to seasonality of fruit production, majority of the respondents could not buy both fruits on a weekly or monthly

basis throughout the year. However, during peak seasons or large supply to various market sources, respondents were able to identify themselves as frequent buyers (80.5%) of the fruits ranging from a volume of 500 grams, which is approximately 1 piece for dragon fruit and 1-2 pieces for guava, up to a kilogram per fruit purchase.

From an individual household perspective, the availability of a retail outlet is a key factor influencing accessibility of these fruits. The predominant market outlet choice for majority of the respondents are the roadside fruit stands or roving vendors of dragon fruit (38%) and guava (61%) as shown in Figure 2. Though wet markets are traditional markets, these outlets are well accepted as major retail sources. However, transition economies are experiencing a rapid growth of the modern retail market types such as supermarket chains. A considerable proportion of respondents was slowly shifting from traditional to modern retail markets. With the growth and restructuring of the retail sector, fruit accessibility to consumers is also fundamentally altered (Romo and Dugal, 2009).

Several reasons are identified behind the individual's preference for the market outlet choice for dragon fruit and guava. Accessibility is a major factor indicating that retail outlets or sources of fruits were available in different places and can be purchased anywhere at any time (Figure 3). The choice for retail formats was also affected by convenience or the ease of doing purchase, and affordability or the reasonable pricing on fruits. Modern retail formats offer convenience to consumers while doing purchase whereas traditional retail markets offer relatively

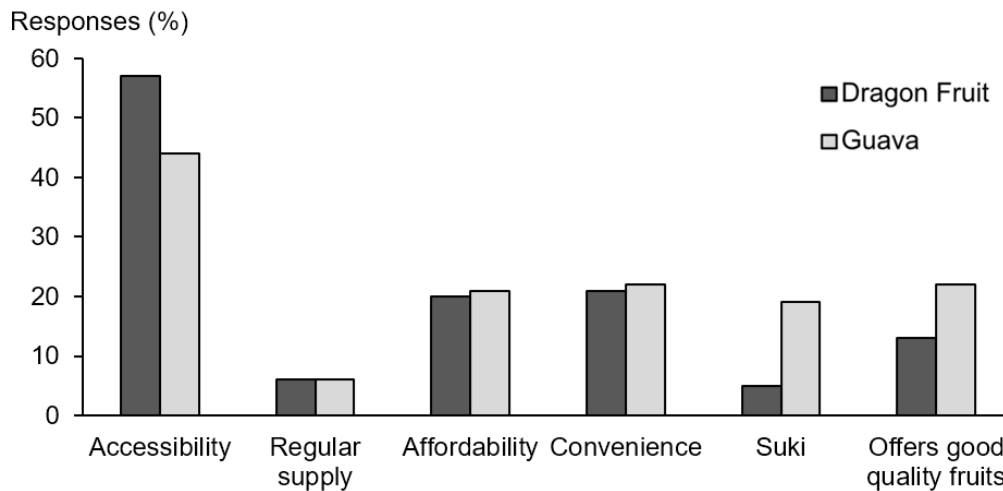


Figure 3: Reasons for market outlet choice, dragon fruit (n=100) and guava (n=100) respondents, 2017

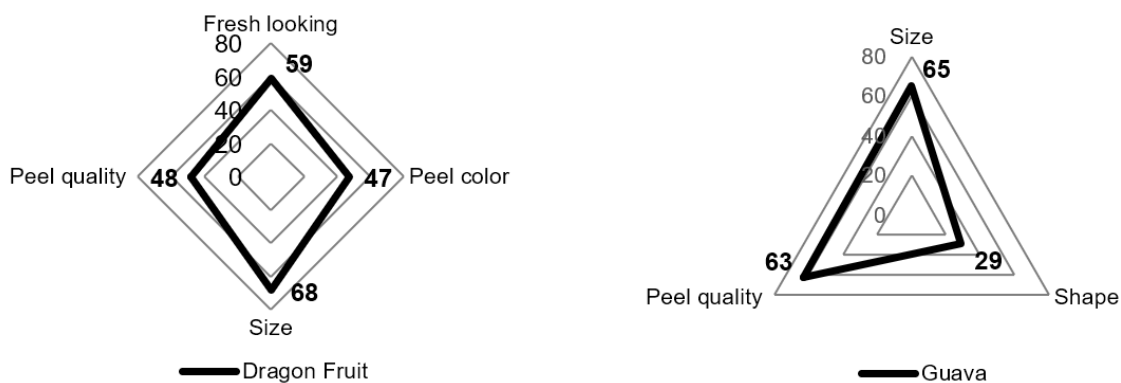


Figure 4: Search attributes preferred by (a) dragon fruit (n=100) and (b) guava (n=100) consumers, 2017

lower prices. From these significant cues, motives behind purchase from various retail sources are realized if they are accessible, convenient to buyers, affordable and of desired quality.

Quality attribute preferences

Quality attribute preferences of individual consumers were influenced by the product's extrinsic and intrinsic indicators offered by the seller (Caswell et al., 2002), whereas an extended classification, as defined by Grunert et al. (2000), is determined according to the level of quality discovered by consumers at different stages of purchase and/or consumption. Intrinsic attributes refer to the physical characteristics of the product and are classified into search and experience attributes (Badar et al., 2015). Search attributes for dragon fruit and guava refer to physical appeal (e.g. size, shape, color) identified by consumers when evaluating significant attribute information before the purchase, while experience attributes (e.g. experiential eating quality such as taste and flavor) are identified only after consumption of the goods (Nelson, 1974). Extrinsic attributes, also called credence attributes, do not constitute a physical part of the product but consumers consider them as increasingly important cues in their purchase decisions (Migliore, et al., 2015). These include food safety, environment-friendly production, origin (Moor et al., 2014) and price.

Majority of consumers value the intrinsic attributes or physical qualities for dragon fruit and guava. By search attributes, consumers were very particular with the size of dragon fruits offered in the market (68%) as shown in Figure 4a. Other search attribute preferences for the fruit include peel color, peel quality and freshness. Specifically, consumers gave highest preference

to dragon fruits that were medium-sized, with shiny and pinkish red peel color, those with blemish-free peel, and bracts exhibiting green color rather than yellow to indicate freshness of the fruits. For guava, search attribute preferences in purchasing fruits also included size (65%), peel quality (63%) and shape (29%) (Figure 4b).

For experience attributes, taste (62%) and flesh color (62%) were clearly among the most relevant and valued preferences for buying dragon fruit (Figure 5a) while taste (64%) and crunchiness/freshness (64%) were among the highest preference for guava consumers (Figure 5b). Specific experiential eating quality components desired by dragon fruit consumers are fruits with red flesh color and are sweet-tasting while fruits having a balance taste of sweetness and sourness as well as white flesh with pinkish seed areas were commonly looked for guava. While flesh color of dragon fruit is mainly considered for having experience attributes, it may also be categorized as search attribute based on the consumers' familiarity with the varieties of the fruit.

Among the full set of attributes, credence attributes are least considered indicated by low proportions of respondents attributing their preferences for both fruits (Figure 6). While price has always been an important characteristic considered in consumer's purchase decision, production-related attributes (e.g. origin and organic production) are generally ranked among the less relevant factors for their decisions (Zanoli et al., 2002; Campbell et al., 2004). This is in congruence with the study of Boccaletti and Nardella (2000) revealing that consumers often doubt the existence of fruits that are "truly organic". Though credence variables are not yet major cues in consumer's

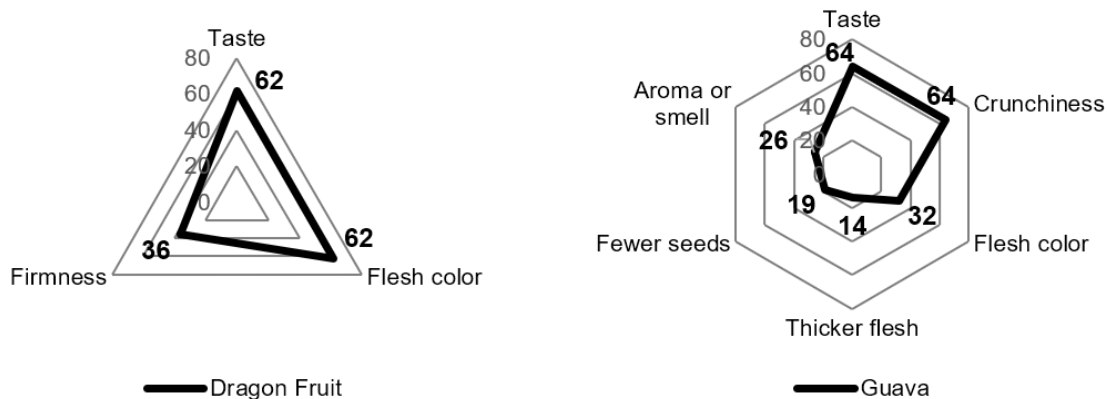


Figure 5: Experience attributes preferred by (a) dragon fruit (n=100) and (b) guava (n=100) consumers, 2017



Figure 6: Credence attributes preferred by (a) dragon fruit (n=100) and (b) guava (n=100) consumers, 2017

purchase behavior, the growing consciousness for environment, food safety, and social responsibility have created attribute values to organic fruit production and origin.

Barriers related to attribute preferences

Consumer preferences for dragon fruit and guava play an important role in the selection process because they indicate the amount of satisfaction that an individual anticipates from eating the fruits (Asp, 1999). However, barriers in selecting fruits tend to influence consumers in relation to their repeat purchase attitude. From the survey, more than half of the respondent for dragon fruit (66%) and guava (64%) expressed purchased disappointments mainly on the quality of the fruits they bought. Based on experience attributes, major causes of disappointment for dragon fruit purchase are undesirable taste, such as those that are not sweet-tasting (53%) and with sour or off-taste (29%), and fruits that are not crisp expressed by too much watery texture (23%) as shown in Figure 7. As to search attributes, primary complaints are fruits with blemishes and decayed portions on the peel, and those that are either too big or small. For credence attributes, a significant proportion expressed dissatisfaction with the relatively high price paid on low quality fruits.

For guava purchase, major disappointments in relation to experience attributes include seediness (44%), fruits that are not fresh indicated by softening (39%), with fruit fly larva in the flesh (20%), and fruits having sour or off-taste (19%) as shown in Figure 8. For search attributes, respondents are dissatisfied with fruits that exhibited blemishes on the peel, with decayed portion, and fruits that are too big or small. For credence attributes, a significant proportion were also dissatisfied with the high price paid for fruits.

Developments in the physiological, psychological and social experiences of individual consumers resulted to disappointments and are related to a certain degree of liking for fruits (Charley and Weaver, 1998). Sensory attributes including

texture, color, size, and flavor were the primary reasons associated to purchase disappointments on both fruits. Liked foods are those that are familiar and usually the ones eaten while disliked foods are rejected because they are unfamiliar to consumers and have never been tasted. Since dragon fruit and

guava are considered as emerging fruits and are generally new to most consumers, they are likely to be rejected because of their unfamiliarity. This trend on food likes and dislikes has been stable for several years (Asp, 1999).

Correlation Analysis

Behavior and attitudes behind dragon fruit and guava purchase and consumption were earlier described by quality attribute preferences for each fruit. The extent of purchase and consumption can further be explained by correlating these attribute preferences to the socio-demographic characteristics of consumers. Through Spearman's rank order correlation, selected demographic characteristics explained and revealed the association and complexity of significant variables relating or affecting preferences for both fruit crops.

Table 2 shows demographic variables affecting preferences for both fruits. Based on the coefficients, age, education, and household income were significantly associated to consumer's preference for certain dragon fruit attributes. Household income is a major variable affecting preferences such as freshness, overall peel quality, firmness and price. It can be inferred that as consumers move to a higher household income level, they become more discriminating when looking for several attributes, both search and experience, in order to get maximum satisfaction or utility.

Consequently, age is positively correlated with the perception that dragon fruit is organically-produced. This would indicate that consumers across all ages, specifically those in higher age groups, are now choosing organically-produced dragon fruits

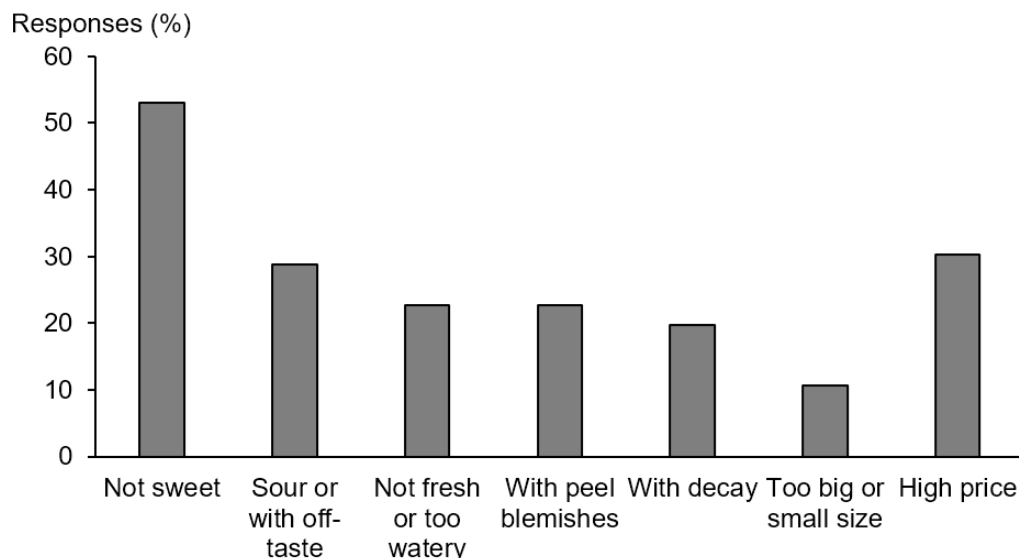


Figure 7: Major disappointments from dragon fruit purchase, 100 respondents, 2017

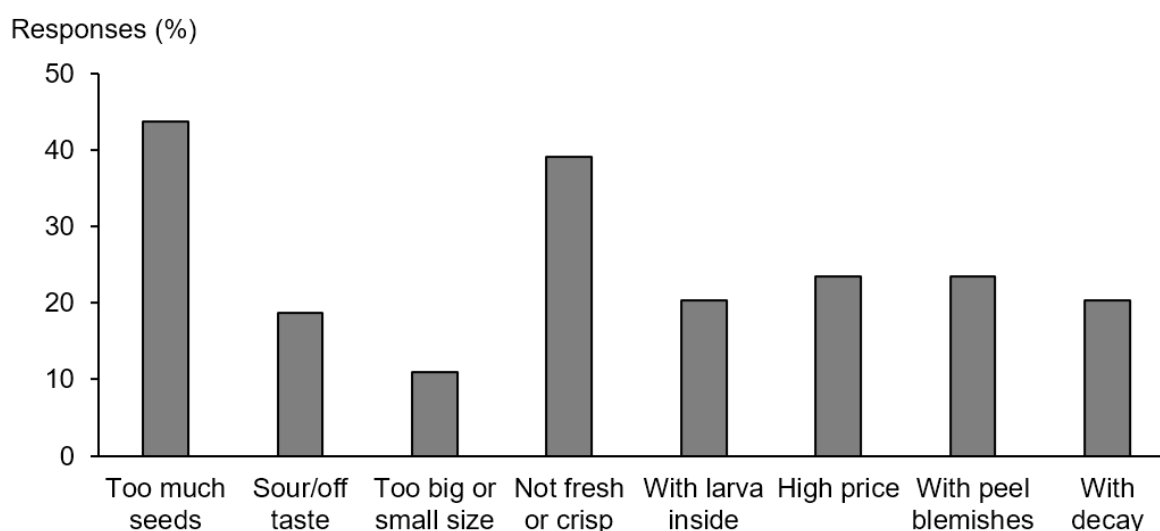


Figure 8: Major disappointments from guava purchase, 100 respondents, 2017

due to their growing awareness of the ill effects of synthetic chemicals on their health. Education is also revealed to be positively correlated with price, which signifies greater price sensitivity of consumers having higher level of education. The results of these correlations were in congruence with the studies of Stables (2001) and Steven and Andrews (2012) on fruit and vegetable consumption.

Meanwhile, the data on education and household size revealed significant correlations on certain quality attribute preferences for guava. As household size increases, consumers become more discerning when searching on attributes concerning taste, crunchiness, price, and preference for minimally-processed guava fruits. Education is also found to be highly associated to some attribute preferences. This would indicate that as level of education increases, consumers become more selective while giving emphasis on taste, crunchiness, and flesh color attribute preferences.

Results of the correlations also showed that among demographic variables, household conditions are found to be strongly related to majority of the quality attribute preferences for both fruits. As household size becomes bigger and/or income level increases, consumers become more active in the selection process concerning quality preferences. In effect, it is also expected to influence purchasing frequency of consumers. This is explained

in the consumer choice model from the study of Kuhar and Juvancic (2005) revealing that higher frequency of purchase is closely related with households' income and size. While experience and search attributes constitute majority to these correlations, it is worth noting that extrinsic attributes such as credence values are taken less into consideration. This possibly shows that developing countries with broader food security issues tend to consider credence attribute less essential than sufficient quantities and dietary needs (Florkowski, 2018).

Consumer Segments

Through clustering approach via *k*-means hierarchical cluster analysis, consumers of each fruit were segmented into three

clusters (Table 3). These clusters are identified as consumer segments or groups that share similar characteristics causing them to have relatively similar product needs within each group. Succeeding tables provided information on the characteristics of each segment based on consumer's socio-demographic profile and quality attribute preferences toward dragon fruit and guava. Dragon fruit consumers were differentiated into three segments namely: (1) health-conscious, (2) aesthetic-conscious/price-sensitive, and (3) size-sensitive groups. The first segment is characterized mostly by married individuals in the older age group with an emphasis on credence attribute preference through organically-produced dragon fruits. Additionally, consumers in

Table 2: Correlation coefficients of selected demographic characteristics and quality attribute preferences, 2017

Quality Attribute Preferences	Socio-demographic Characteristics			
	Age	Education	Household Income	Household Size
<i>Dragon Fruit (n=100)</i>				
Freshness	-0.025	0.169	0.279**	-0.075
Peel Color	0.045	-0.037	0.040	-0.052
Size	0.053	-0.105	-0.022	-0.032
Peel Quality	0.034	0.075	0.235*	-0.105
Taste	-0.113	0.163	0.075	-0.087
Flesh Color	0.098	-0.005	-0.029	-0.037
Firmness	-0.015	0.096	0.205*	-0.104
Production System ^a	0.212*	0.045	0.027	-0.151
Price	-0.161	0.220*	0.200*	0.125
<i>Guava (n=100)</i>				
Size	-0.084	0.038	0.064	0.145
Peel Quality	-0.119	0.153	0.126	0.253*
Taste	-0.062	0.229*	-0.124	0.177
Crunchiness	0.016	0.367**	-0.133	0.253*
Flesh Color	0.030	0.210*	-0.091	0.175
Production System ^a	0.012	0.059	-0.069	0.005
Price	-0.024	0.115	0.004	0.271**
Minimally-processed	-0.130	-0.169	0.073	-0.215*

^a Organically-produced

* correlation is significant at 0.05 level

** correlation is significant at 0.01 level

Table 3: Dragon fruit consumer segments based on cluster analysis, 100 respondents, 2017

Health-conscious Group (n=32)	Aesthetic-conscious/ Price-sensitive Group (n=35)	Size-sensitive Group (n=33)
<i>Quality Attribute Preferences</i>		
No particular size	No particular size	Medium to large fruits
No taste specification	Balanced taste of sweetness and sourness	More sourness than sweetness
Either red or white fleshed	Red-fleshed fruits	Red-fleshed fruits
No preference on freshness	Preference on freshness indicated by green bracts	No preference on freshness
Moderately shiny peel	Moderately shiny peel	Slightly shiny peel
Particular on peel quality (free from defects and blemishes)	Particular on peel quality (free from defects and blemishes)	No peel quality specification
Slightly firm fruits	Moderately firm fruits	Slightly firm fruits
Prefers organically-produced	Either organic or conventional	Either organic or conventional
Not price conscious	Moderately price conscious	Not price conscious
<i>Socio-demographic Characteristics</i>		
Majority are female	Majority are male	Majority are female
Majority are married	Majority are married	Majority are single
Older age group (61 years old and above)	Younger age group (21 to 40 years old)	Younger age group (21 to 40 years old)
College level	College level	High school to College level
Lower to middle income level (PhP 150,000 to 250,000)	Middle to higher income level (PhP 250,000 and above)	Lower income level (PhP 150,000 and below)
Small household size (below 4 members)	Small household size (below 4 members)	Small household size (below 4 members)

this segment are less affected by the search and experiential eating qualities of the fruit.

Those in the aesthetic-conscious/price-sensitive group are primarily composed of married individuals in the younger age group with higher income levels. As they buy with their eyes, emphasized by their preference on freshness (bracts or scales that are still green indicate dragon fruits are freshly-harvested), flesh color (red-fleshed fruits) and peel quality attributes (freedom from defects, decay, and blemishes), price being offered is also considered.

Lastly, segmented consumers in the size-sensitive group are

comprised of younger consumers, mostly single and in lower income levels. The overall product quality preferred by this segment are those ranging from medium to large red-fleshed fruits and an overriding taste of sourness than sweetness. Even though consumers in this group are mostly in the lower income levels, they are more likely willing to pay for additional increase in price given that the size requirements are met.

Guava consumers were also classified into three segments labelled as the convenience-inclined, aesthetic-conscious, and taste-sensitive groups (Table 4). The convenience-inclined group consisted the middle age group in the lower to middle income level. The group gave highest importance to

Table 4: Guava consumer segments based on cluster analysis, 100 respondents, 2017

Convenience-inclined Group (n=43)	Aesthetic-conscious/ Price-sensitive Group (n=30)	Taste-sensitive Group (n=27)
Quality Attribute Preferences		
Either white or with pinkish seed areas	Prefers flesh with pinkish seed areas	Prefers flesh with white seed areas
No taste specification	No taste specification	Balanced taste of sweetness and sourness
No peel quality specification	Particular on peel quality (free from defects and blemishes)	Particular on peel quality (free from defects and blemishes)
No preference on freshness	No preference on freshness	Specific on freshness indicated by crunchiness
Not price conscious	Moderately price conscious	Moderately price conscious
Prefers minimally-processed or fresh-cuts	Prefers fresh whole fruit	Prefers minimally-processed or fresh-cuts
Socio-demographic Characteristics		
Majority female; few male	Majority female; few male	Majority male; few female
Majority are married	Majority are single	Majority are single
Middle age group (41 to 60 years old)	Younger age group (21 to 40 years old)	Younger age group (21 to 40 years old)
High school to College level	College level	High school to College level
Lower to middle income level (PhP 150,000 to 250,000)	Middle to higher income level (PhP 250,000 and above)	Lower income level (PhP 150,000 and below)
Small household size (below 4 members)	Large household size (8 members and above)	Large household size (8 members and above)

convenience when buying guavas as they prefer minimally-processed fruits (fresh-cuts) without being quality- and price-sensitive. Consumers comprising the second segment belonged to the younger age group with the middle to higher income level. These consumers give importance to appearance while being sensitive to the price offered. Specifically, they prefer fruits with flesh that have pinkish seed areas, hence referred as aesthetic-conscious/price-sensitive while those in the taste-sensitive group are characterized by younger age group in the lower income level preferring minimally-processed fruits having a balance taste of sweetness and sourness.

Based on the clustering analysis, patterns between dragon fruit and guava segments, particularly in the health-conscious and convenience-inclined groups, were distinguished. These consumer segments were heavily characterized by middle to older age groups with less considerations to price. Overall, it appeared that dragon fruit consumers in the health-conscious segment, specifically elderly people, were concerned with the potential harm that conventional food production practices may bring to their personal health concerns (Midmore et al., 2005). Hence, price adjustments made in reducing the perceived risks associated with the use of pesticides, genetically modified organisms (GMOs), and additives must be taken into consideration.

Accordingly, this behavior is also observed in the convenience-inclined segment for guava. In response to convenience preferences, consumption in the form of fresh-cuts is increasing among fruits (Florkowski, 2018). Price changes brought about by the reflected demand for fresh-cut popularity did not seem to affect consumers' willingness to pay for minimally-processed fruits.

Aesthetic-conscious/price-sensitive groups of both fruits also presented similarities in terms of the segment's characteristics. Both groups were characterized by the younger age group in the higher income levels. The subset of consumers was recognized to pay more attention to visual quality components such as greenness of bracts (for dragon fruit), flesh with pinkish seed areas (for guava) and overall peel quality (both fruits) while

being price-conscious. Higher quality justifying higher prices in economic terms is reflected by their willingness to pay premium prices. This was also observed in the study of Florkowski (2018) on fruit consumption.

Implications for Value Chain Improvement

Production, distribution, and consumption are fundamentally dependent on consumer preferences and choices. With the increasing awareness on emerging fruits, such as dragon fruit and guava, preferences and choices can influence activities and management along the value chain. Currently, value chain actors, such as producers and traders, respond primarily to these preferences with the goal to satisfy and meet consumer demands. Motives behind the consumption of these fruits, including patterns and behavior, their correlations and consumer segments, were made available via consumer research in attempting to provide bases for possible improvement and development opportunities along the value chain. The information obtained in this study also provided some guidance for priority researchable areas to pursue in value chain improvement as follows:

Production Subsystem

Dragon fruit and guava are cultivated in small-scale backyards or grown commercially on a bigger scale. Therefore, quality improvements will need to start in the production subsystem of the value chain. Consequently, consumer preferences for both fruits, which mostly considered intrinsic fruit attributes, both search and experience, can be achieved by making changes and development in this subsystem.

Improvements can be made by identifying existing varieties planted and evaluation of quality characteristics in different production areas and systems. Appropriate varieties could be selected from existing ones or new varieties may need to be developed to meet consumer preferences for some visual and taste attributes including size, shape, color, flavor or taste. Improvements in the cultural management practices including fertilization, irrigation and pest and disease management should also be undertaken. For instance, application of potassium as fertilizer, which is known to enhance sweetness of fruits, and the use of integrated pest management (IPM) to produce fruits that

are free from insect damage and decay while assuring consumer's safety are some of the technologies that can be introduced. Additionally, approach in crop production involving organic production may also be taken into consideration for some credence attribute preferences (organic production). Establishing the appropriate maturity indices is necessary because eating quality is greatly determined by its maturity.

Postharvest Subsystem

Being a newly-cultivated crop, studies on maintaining the postharvest quality and extending the shelf life of dragon fruit and guava are limited. However, in response to consumer preferences for these fruit crops, various research efforts put greater attention in maintaining quality to increase consumer confidence on fruits that they purchase.

Researches on dragon fruit focused on shelf life extension using appropriate packaging and coating, delaying bract or scale drying and discoloration, and chilling injury alleviation (Rodeo and Esguerra, 2018). Postharvest technologies have been developed in maintaining and improving the quality of dragon fruit including freshness, overall visual quality, peel color, and disease control. The use of chitosan coating and low temperature conditioning for red-fleshed dragon fruit were found to maintain the visual quality of the fruit, reduce rate of bract yellowing, enhance red peel color and quality, and reduce disease development (Castro et al., 2018). Use of 1-methylcyclopropene (1-MCP), an inhibitor of ethylene production, on fresh-cut dragon fruits was studied by Tadeo (2016). Results showed that the fruit was deemed a good commodity for fresh-cut processing as it delayed browning in fresh-cuts. Currently, postharvest technologies are studied and being developed in delaying bract discoloration and controlling diseases.

While studies on dragon fruit postharvest technologies are developed, however, there are limited studies on characterizing postharvest behavior and techniques to improve quality of guava. Hong et al. (2012) studied the effects of chitosan coating on the postharvest life and quality of the fruits during cold storage while Harb and Hasan (2012) analyzed the effects of 1-MCP in prolonging the shelf-life and changes in aroma profile of the fruit. Currently, there are ongoing efforts to possibly delay ripening, reduce browning and control disease of guava through 1-MCP and hot water treatment. Still, with limited information on improving quality of guavas, appropriate postharvest techniques are needed to be established to satisfy consumer preferences.

Marketing Subsystem

Understanding consumer preferences, consumption patterns and behavior provided valuable information in addressing possible mismatch in production and consumption. Equally, data obtained from correlation of demographic profile and quality attributes, as well as market segments, can provide a basis for market positioning of dragon fruit and guava.

The results of the study offered detailed analysis on different consumer segments by characterizing how consumers differ based on their behavioral and demographic profiles. It may offer appropriate information to value chain actors in developing marketing strategies aimed at certain consumer groups. For instance, for the health-conscious segment, the "health benefits" and "organic production" of dragon fruits can be promoted to the consumers. For the convenience-inclined segment, guava producers and traders can directly market their produce to supermarkets since ease or convenience when buying is offered by these market outlets. In short, targeting consumers and positioning the fruits in the market should effectively satisfy individual consumer needs with respect to attribute preferences identified, may it be search, experience, or credence. Target

markets should focus on convincing consumers that these attributes confer a value added to them (Moser et al, 2011).

CONCLUSION

Growing attention has been paid to the consumption of emerging fruits, specifically in urban centers in the country. Consumer research provided information on quality attribute preferences, patterns and behavior, their correlation on socio-demographic characteristics, and classified market segments in response to the increasing popularity and demand for dragon fruit and guava.

Filipino urban consumers still put greater value on intrinsic attributes, specifically on visual and taste components of the fruits. Freshness, peel color, overall peel quality (freedom from blemishes, diseases and decay) and taste were clearly among the most valued quality attribute preferences for both fruits. These preferences were correlated to selected socio-demographic characteristics where household conditions were revealed to be strongly related to majority of the preferences. As household size becomes bigger and income level increases, consumers become more active in the selection process concerning quality preferences.

Market segmentation provided information on shared characteristics of consumers with similar product needs within the group. Additionally, patterns and behavior of consumer segments across fruit type were identified. Health-conscious and convenience-inclined groups were found to be less sensitive to price changes while aesthetic-conscious/price-sensitive groups were recognized to pay more attention to visual quality components while being price-conscious. However, barriers in selecting fruits such as purchase disappointments tend to influence consumers in their repeat purchase attitude signaling a possible mismatch in production and consumption.

The information on important consumer research questions may draw some implications useful for value chain improvement and development of these fruits. Changes along the value chain from production, postharvest handling, and marketing, as well as concomitant priority research areas, can be undertaken to capture consumer preferences. Consequently, this would translate to increased market demand from satisfied consumers from various market segments, reduced losses, and chain efficiency which could propel the development of the emerging industries of dragon fruit and guava.

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CONFLICT OF INTEREST

No conflict of interest.

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