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Consumers' Perceptions on Food Safety of Vegetables in Davao City, Philippines

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Abstract

The food safety issue has become a public health priority. Serious outbreaks have been reported over the past few decades because of eating unsafe food. Food-borne diseases such as *Salmonella* spp., *Campylobacter* spp., and bovine spongiform encephalopathy (mad-cow disease) pose a serious threat to consumers. However, there is a dearth of study of consumer perceptions in the Philippines regarding food safety of vegetables. Therefore, this study investigated how consumers define *food safety* and analyzed their purchasing habits. A household survey of 300 respondents, 100 each from low-, middle-, and high-income groups, was conducted. The study selected *ampalaya* (bitter gourd), *pechay* (bok choy), and lettuce for the valuation scenario since these vegetables are more exposed to pesticides. We found that all income groups are more concerned with the visual appeal of the vegetables. This included the appearance, freshness, cleanliness, and presence of physical damages. The low-income group bought vegetables from the wet market at least twice a week and has less awareness of food safety. The low-income respondents were price conscious and had the highest average quantity of *ampalaya* purchased (0.69 kg). They rarely bought lettuce and were not particular on the food safety labels and brand names. Meanwhile, the middle-income group purchase vegetables from the wet market and supermarket weekly. This income group bought the highest average quantity of *pechay* (0.48 kg) and lettuce (0.72 kg). They defined *food safety* as "clean vegetables," and some have started to be food safety conscious by purchasing vegetables that are organic, food safety labeled, and well packaged. Similarly, majority of the high-income group bought vegetables from the supermarket weekly and were more concerned about food safety. They defined *food safety* as "proper food handling" and thought that food safety in vegetables meant naturally grown, organic, and chemical/pesticide-free vegetables. Based

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on the results, vendors should wash vegetables to take away residues such as dirt and biotic and nonbiotic contaminants to satisfy consumers' expectations and to generate consumer loyalty. The results of the study show that for the wet market, transactions in volumes should be continued and enhanced to provide low prices for the consumers. For the supermarket, innovation in food products can be done through the inclusion of food safety labels and certifications in the packaging of the vegetables sold.

Keywords: *ampalaya*; consumer perceptions; Davao City; food safety; lettuce; *pechay*

Abbreviations:

DA – Department of Agriculture
DepEd – Department of Education
DOH – Department of Health
HACCP – Hazard Analysis Critical Control Points
GAP – good agricultural practices
GHP – good handling practices
MRLs – maximum residue levels
PhP – Philippine peso
SPSS – Statistical Package for the Social Sciences

Introduction

Food-borne diseases are a serious concern for the consumer. Numerous outbreaks of *Salmonella* spp., *Campylobacter* spp., and bovine spongiform encephalopathy (mad-cow disease) have been reported over the past few decades. In addition, chemical contamination has emerged as an important source of food-borne illnesses because of the purposeful application of pesticides, veterinary drugs, and food additives. The most recent case of contamination from additive was the contamination of dairy foods in China with melamine (Weise, 2008).

Fresh produce is emerging as one of the top 4 high-risk foods in the United States, with fresh produce linked to 82 outbreaks of food poisoning from products such as lettuce, tomatoes, potatoes, and spinach (DeWaal, 2003). Nearly 5% of all food-borne outbreaks were related to leafy greens. The majority of these were caused by norovirus, *Salmonella*, and *E. coli*. In the Philippines, at least 5 people were hospitalized due to vomiting and stomach pains after eating *ampalaya* (bitter gourd) (GMANews, 2009). In Bohol, cyanide poisoning left 105 children hospitalized and 30 dead after eating a native delicacy made from cassava (Filipino Express Online, 2005).

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Inadequate knowledge of production, storage, and handling processes often lead to food contamination. Fresh vegetables are prone to microbial contamination during production and distribution (López Camelo, 2004). Other studies have shown evidence of pesticide residues in vegetables. Central Luzon State University gathered samples of *ampalaya* and eggplant, both of which tested positive for organophosphate pesticide residues (Paragas, n.d.; cited in Agarrado, 2003).

Most vendors believe that freshness is the consumers' first consideration in buying fresh vegetables. Since most vendors in the traditional wet markets do not have appropriate refrigeration facilities to prolong the freshness of vegetables, they often opt to sprinkle them with water, which can increase the incidence of bacterial contamination (Holmer and Potutan, 2001). Some vendors even admit to soaking their vegetables in water containing a solution of toxic elements such as formaldehyde and bleaching agents such as sodium hydrosulphite to keep their products fresh and green (Sukrung, n.d.). Since most vegetables are consumed fresh, the presence of potential pathogens, nitrates, and other fertilizers or organic amendments can present a danger to public health (López Camelo, 2004). Consequently, it is worthwhile to study the consumers' perceptions of the safety of vegetables.

Consumers' Perceptions When Buying Fresh Produce

In purchasing fresh food, consumers' perceptions are influenced by numerous factors that are often quite complex and interrelated (López Camelo, 2004). Perceptions and attitudes may vary according to age, gender, educational level, and other socio-demographic factors. Irrespective, there is a growing demand for fresh produce to be of good quality, both externally and internally. The external aspects include appearance, freshness, presentation, and uniformity. Although the internal quality dimensions such as flavor, aroma, nutritional value, and freedom from contamination cannot be evaluated prior to consumption, consumers usually rate these variables of equal importance. Appearance, taste, freshness, price, quality, color, and texture were the key criteria that consumers considered when purchasing fresh vegetables.

Appearance is the most important factor that most consumers considered when buying fresh fruit and vegetables from retail stores (Figure 1) (López Camelo, 2004). On the other hand, the least important factor was the brand name of the product. Certified safe, by residue testing, was the fifth most important factor consumers considered in their decision to purchase.

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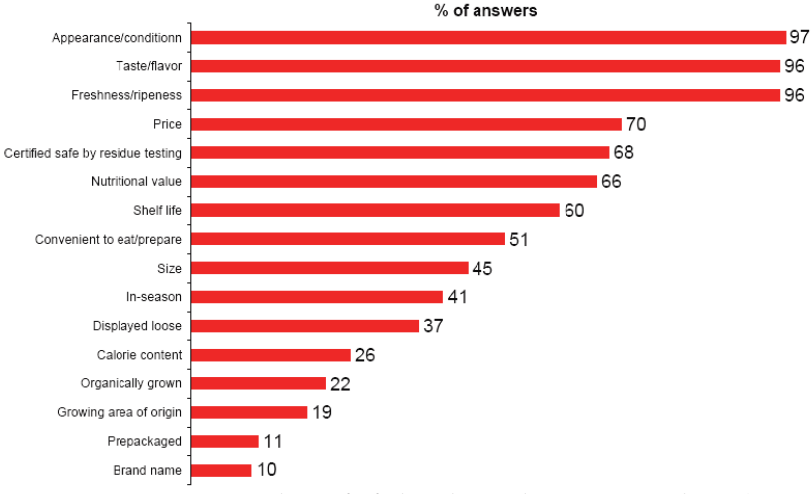

Figure 1. Consumers' evaluation for fresh produce attributes (López Camelo, 2004)

Purchase and Consumption Behavior of Consumers When Buying Vegetables

According to Concepcion (2009), consumers utilize 5 criteria in their decision to purchase fresh vegetables: price, quality, phytosanitary considerations, product appearance, and packaging. The Philippine market for fresh vegetables is price sensitive; thus, most consumers consider price first in their decision to purchase. Quality was represented by product attributes like taste, ease of cooking, firmness, and ease of storage. Consumers ranked phytosanitary variables as the third most important group of variables. This group included freedom from pest and damage from diseases, freedom from mechanical and physical injury, free from soil, and free from chemical residues. Product appearance included good shape, size, and color. Packaging was the least important variable for consumers.

Food Safety

In Victoria, Australia, food safety was normally assumed unless proven otherwise and considered only if unsafe practices were observed (Campbell Research and Consulting, 2005). Food safety was a latent variable, referred to as being present "in the back of the consumer's mind," unlike those traits such as value, taste, and quality. However, the majority of Victorians read food

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labels as a way of verifying the freshness of food products by referring to "use-by dates" or "best-before dates."

In the United Kingdom, the number of people concerned about food safety issues has remained stable from 2000 to 2004 (FSA, 2004). Approximately 7 out of 10 respondents say that they are "very" or "fairly" concerned about food safety. However, 50% were not concerned about the wider issues relating to food, and in general, the perception of food safety was neither better nor worse from 2003 to 2004.

In the Philippines, 34% of respondents believed that food safety was of high or very high importance (DPI Victoria, 2003). According to the respondents, most of whom were importers, distributors, food processors, and manufacturers, *food safety* means the proper handling of food and the provision of "food that is safe to eat." Only a few respondents stated issues such as chemical residues, certificates (e.g., FDA permits), Hazard Analysis Critical Control Points (HACCP), and cold chain management. Furthermore, respondents believed that consumers do not care as much about food safety and clean food since most of them still purchase from wet markets where sanitation is poor. The majority of respondents made no distinction between "clean food" and "food safety." According to them, clean food implies food being "contaminant free and hygienically prepared." Some respondents said that it was "pesticide free," and one respondent said "organic." Physical appearance was seen as being more important to consumers than the biological issues such as green food.

Throughout much of Asia, measures to ensure food safety are inadequate despite the fact that most producers and retailers readily acknowledge that fresh fruit and vegetable can become contaminated from a variety of sources (Shepherd and Tam, 2008). Given that the majority of fresh produce continues to be sold and distributed through the wholesale markets, there is a lack of financial incentives for producers to provide safe vegetables. Furthermore, in many Asian countries, the nature of the loans that are often extended to farmers encourage the excessive use of chemicals. In addition, market intermediaries seem largely unaware of the microbial hazards fresh fruit and vegetables may be exposed to during their distribution.

Given the potential food safety risks that exist, the consumer demand for safe fresh fruit and vegetables may become a positive driver for change, if accompanied by appropriate legislation. This paper seeks to examine the importance consumers in Davao City, Philippines, place on food safety in making their decision to purchase 3 types of vegetables: *ampalaya* (bitter gourd), *pechay* (bok choy), and lettuce. Specifically, consumers from 3 socio-economic groups are compared based on their attitudes and opinions regarding food safety.

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Materials and Methods

The study was conducted among selected households in Davao City using a structured questionnaire. Households were defined as the sampling unit. The respondents selected from each household were the decision makers and/or influencers in the purchase of fresh fruit and vegetables.

The study collected both qualitative and quantitative data for the analysis of attitudes, opinions, and the socio-economic characteristics of the consumers. The Slovin Formula was used in the computation with an allowable error of 6% in order to determine the ideal sample size from the population. In August 2007, Davao City had a total population of 1,366,153 (NSO, 2007); hence, the ideal sample size for this study was 278.

However, rather than to simply draw the sample at random, Concepcion's study (2009) have shown that the purchase and consumption of fresh vegetables is influenced by household income. As a result, quota sampling was used where the population was first segmented into mutually exclusive subgroups. A total of 300 respondents were interviewed in this study, 100 respondents each from the low-, middle-, and high-income groups.

In order to classify households on the basis of socio-economic status, place of residence was used. The high-income group (Class ABC1) is mostly located in exclusive subdivisions with predominantly large concrete houses which are built from high-quality materials, well painted, and expensively furnished. Facilities in the house would include a car and any 8 facilities such as television, telephone, computer, cable TV, gas or electric oven, air-conditioning unit, microwave oven, Internet connection, or refrigerator. Their household heads are usually professional businessman, senior executives, or the owners of large farms, with a total monthly household income of PhP30,001 and above. The middle-income group (Class C2) has a household income of PhP 15,001–30,000 and mostly reside in mixed neighborhoods with large and small houses. Their homes are generally constructed from heavy and light materials, painted, but may need some repairs. Class C2 has more than basic utilities in the home, with 5 to 7 facilities, with or without car. The occupations of the household heads are professional, small businessman, small farm owners, junior executives, and white-collar and skilled workers. For the low-income group (Class DE), their total monthly household income is generally below PhP15,000. Their houses are typically located in slum districts, poorly constructed from very light and cheap materials, and generally unpainted. They have less than 4 facilities within the home. The household heads are farm tenants, unskilled or blue-collar workers, and foremen (Virola et al., 2007).

The data was collected through person-to-person interviews with respondents from the different households of Davao City from October 2009 to December 2009. If the person who answered the door was at least 18 years

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and was knowledgeable about the purchasing practices of the household for vegetables, that person was interviewed. If not, the interviewer would ask for someone in the household who could answer the questions. Respondents were then asked about the criteria they used when purchasing fresh vegetables using the 5-point Likert scale where 1 was "not at all important" and 5 was "very important." Data was encoded and entered into SPSS for analysis.

Results and Discussion

Females were primarily responsible for the decision to purchase fresh vegetables in the household for all 3 income groups. The majority of the respondents were married with an average age of 39 years. More than half of the middle- and high-income respondents were college graduates. For the low-income group, half of the respondents were high school graduates (Table 1).

The average household size was 6 members, although the household size ranged from as little as 1 to as many as 18 members. There were at least 2 working family members for the middle- and high-income groups, but for the low-income group, in the majority of households, there was only 1 working family member. Of the respondents, 49% were employed.

Table 1. Socio-demographic profiles of the respondents

Variables	Low income	Middle income	High income
Gender	Female (89%)	Female (75%)	Female (80%)
Civil status	Married (75%)	Married (57%)	Married (74%)
Age	35 to 49 years old (46%)	35 to 49 years old (40%)	35 to 49 years old (51%)
Educational attainment	High school graduate (49%)	College graduate (61%)	College graduate (84%)
Household size	5 members (21%)	4 members (25%)	5 members (31%)
Working family members	1 member (54%)	2 members (51%)	2 members (51%)
Working status	Self-employed (50%)	Employed (55%)	Employed (70%)
Monthly income bracket for household	Less than Php8,000 (71%)	Php15,001–30,000 (46%)	Php 50,001 and above (51%)

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Purchasing Habits

The respondents were asked about their usual place of purchase, the number of times they bought fresh vegetables, and the quantity of fresh vegetables (in kg) that they last bought. To understand their purchase and consumption behavior, respondents were asked to answer 9 statements using the 5-point Likert scale from "never" to "always."

Most of the low-income group bought fresh vegetables in wet markets and *talipapa /laray*[1] (Table 2) at least twice a week (Table 3).

Most of the respondents from the low-income group bought vegetables more frequently compared to the middle- and high-income groups, possibly because increased frequency meant a smaller cash outlay. Low-income households generally have less disposable income and possibly less storage space (Concepcion, 2005); thus, respondents usually purchased fresh vegetables when they were about to cook them.

The low-income group purchased more *ampalaya* and significantly less lettuce that the other income groups (Table 4). They rarely bought lettuce in the

Table 2. Usual place of purchase, by socio-economic group

Where do you buy vegetables?	Low income	Middle income	High income	Total (n)
Wet market	83	82	64	229
Supermarket	11	41	67	119
Retail stores	16	3	1	20
Lako (itinerant vendor)	12	4	1	17
Talipapa /laray	41	20	3	64

Table 3. Purchase frequency, by socio-economic group

How often do you buy vegetables?	Low income	Middle income	High income	Total (n)
At least once a day	24	10	5	39
At least twice a week	29	28	28	85
Weekly	24	49	59	132
Twice a month	2	6	5	13
Monthly	1	1	2	4
Others	20	6	1	27
Total	100	100	100	300

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wet market and not at all in the supermarket. They seldom purchased vegetables that were organic, food safety labeled, or well packaged (Table 5).

The middle-income group bought vegetables from the wet markets and supermarkets. Nearly half of the middle-income group purchased vegetables weekly. The middle-income group often bought *ampalaya* and *pechay* in the wet market and sometimes in the supermarket. Most of them rarely bought lettuce, but they sometimes purchased vegetables that were organic, food safety labeled, and well packaged.

Table 4. Quantity of last purchase, by socio-economic group

Vegetables	Low income	Middle income	High income	Total average
Ampalaya	0.66[a]	0.61[a]	0.59[a]	0.62
Pechay	0.42[a]	0.46[a]	0.41[a]	0.43
Lettuce	0.06[a]	0.29[b]	0.39[b]	0.25

Note: Those items in the same row with the same superscript are not significantly different at p = 0.05.

Table 5. Purchase and consumption behavior, by socio-economic group

Commodity / place of purchase	Low income (n=100)	Middle income (n=100)	High income (n=100)
Ampalaya			
Wet market	3.87[b]	3.56[b]	2.98[a]
Supermarket	1.53[a]	2.60[b]	3.44[c]
Pechay			
Wet market	3.99[b]	3.52[a]	3.14[a]
Supermarket	1.45[a]	2.66[b]	3.40[c]
Lettuce			
Wet market	2.24[a]	2.06[a]	2.14[a]
Supermarket	1.22[a]	2.25[b]	3.28[c]
Vegetables with food safety labels	1.90[a]	2.47[b]	2.74[b]
Organic vegetables	2.38[a]	2.79[ab]	2.82[b]
Well-packaged vegetables	2.09[a]	3.03[b]	3.01[b]

Note: Where 1 is "not at all" and 5 is "always." Those items in the same row with the same superscript are not significantly different at p = 0.05.

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On the other hand, the high-income group bought vegetables from the supermarkets and wet markets. They purchased vegetables weekly, most often in the supermarket. The high-income group sometimes bought lettuce in the supermarket but seldom in the wet market. Most of the high-income group sometimes bought vegetables that were organic, food safety labeled, and well packaged.

The higher the income class, the more probable it is that the household will buy lettuce and the more likely it is that they will buy it from a supermarket. Similarly, middle- and high-income groups are more likely to look for food safety labels and good packaging in making their decision to purchase. As income rises, the likelihood of purchasing organic vegetables also rises.

Customers' Criteria When Buying Vegetables

The majority of respondents were more particular about the appearance, freshness, cleanliness, and freedom from physical damage in their decision to purchase vegetables. Among the income groups, the low-income group was most sensitive to price (Table 6).

For the importance rating for *ampalaya*, the majority of the respondents were more particular on the appearance, freshness, cleanliness, and freedom from physical damages. Among the income groups, similar responses were given for appearance, freshness, size, cleanliness, the absence of any holes, organically grown, free from soil, washed, sliced, and packed. The low-income group was most sensitive to price. Consequently, there was a significant difference in the responses between the low- and high-income groups in terms of price, food safety labels, and the place of purchase.

For the importance of the attributes as given for *pechay*, the results showed that consumers were quite particular on the appearance, freshness, cleanliness, and freedom from physical damage. All income groups had similar responses regarding freshness, size, cleanliness, no holes, and the presence of food safety labels. However, there was a significant difference between the responses given by the low- and high-income groups with regard to the appearance, price, and brand name of *pechay*. There was no significant difference between the middle- and high-income groups in terms of preference for organically grown *pechay*, chemical/pesticide-free *pechay*, and place of purchase.

All income groups had similar responses for size, price, no holes, organically grown, chemical/pesticide-free, free from soil, with food safety labels, with brand name, washed, and well-packed lettuce. The middle- and high-income groups placed significantly more importance on appearance, freshness, cleanliness, and freedom from physical damage than the low-income group.

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Table 6. Consumers' criteria when buying vegetables, by socio-economic group

Criteria	Low income			Middle income			High income		
	Am-palaya (n=99)	*Pechay* (n=100)	Lettuce (n=17)	*Am-palaya* (n=100)	*Pechay* (n=100)	Lettuce (n=54)	*Am-palaya* (n=100)	*Pechay* (n=100)	Lettuce (n=75)
Appearance	4.70[a]	4.82[b]	4.24[a]	4.69[a]	4.81[ab]	4.76[b]	4.52[a]	4.61[a]	4.67[ab]
Freshness	4.86[a]	4.90[a]	4.24[a]	4.88[a]	4.94[a]	4.78[b]	4.93[a]	4.91[a]	4.95[b]
Size	4.11[a]	4.18[a]	3.41[a]	3.89[a]	3.92[a]	3.65[a]	3.79[a]	3.85[a]	3.77[a]
Price	4.49[b]	4.67[b]	4.18[a]	4.35[ab]	4.35[ab]	4.20[a]	4.11[a]	4.02[a]	3.88[a]
Clean	4.78[a]	4.74[a]	4.29[a]	4.86[a]	4.85[a]	4.85[b]	4.82[a]	4.83[a]	4.84[b]
No Holes	4.71[a]	4.63[a]	4.24[a]	4.65[a]	4.61[a]	4.61[a]	4.56[a]	4.49[a]	4.64[a]
Organically grown	3.26[a]	3.27[a]	3.53[a]	3.72[a]	3.83[b]	3.89[a]	3.70[a]	3.79[b]	3.71[a]
Free of chemicals and pesticides	3.39[a]	3.46[a]	3.65[a]	3.93[b]	4.04[b]	4.11[a]	4.19[b]	4.24[b]	4.20[a]
Free from soil	3.99[a]	3.90[a]	3.76[a]	4.27[a]	4.35[b]	4.28[a]	4.17[a]	4.10[ab]	4.29[a]
With food safety labels	2.78[a]	2.78[a]	2.76[a]	3.21[ab]	3.19[a]	3.48[a]	3.34[b]	3.25[a]	3.48[a]
With brand name	2.03[a]	2.09[a]	2.47[a]	2.35[a]	2.40[ab]	2.63[a]	2.86[b]	2.85[b]	2.93[a]
Washed	2.94[a]	3.40[ab]	2.88[a]	2.44[a]	3.87[b]	3.81[a]	2.57[a]	3.06[a]	3.31[a]
Packed	2.40[a]	2.47[a]	2.59[a]	2.86[a]	3.09[b]	3.26[a]	2.83[a]	2.93[ab]	3.20[a]
Place of purchase	3.41[a]	3.42[a]	2.88[a]	3.83[ab]	3.92[b]	4.07[b]	3.97[b]	3.98[b]	4.13[b]

Note: Where 1 is "not at all" and 5 is "always." Those items in the same row per income class with the same superscript are not significantly different at p = 0.05.

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Consumers' perceptions on food safety of vegetables

The majority from the middle- and high-income groups had heard the word *food safety* while more than half of the low-income respondents have not heard of the term at all (Table 7).

The low-income group defined *food safety* as "safe food" (26%), "healthful food" (19%), "clean food" (16%), and "properly handled food" (14%) (Table 8). Most of them thought that *food safety in vegetables* meant "healthful vegetables" (21%), "clean vegetables" (15%) and "good vegetables" (15%) (Table 9). Nearly half of the low-income respondents (48%) have seen food safety labels for organic (48%) and pesticide-free (29%) vegetables (Table 10). The low-income group described food safety–labeled vegetables as "green-colored vegetables" (26%), "fresh" (15%), "with small-sized labels" (13%), "small-sized vegetables" (8%), "nice-looking appearance" (5%), and "with no chemicals" (5%) (Table 11).

The middle-income group defined *food safety* as "clean food" (25%), "safe food" (19%) "healthful food" (16%), "properly handled food" (16%), "nontoxic" (11%), and "safe to eat" (10%). Most of them thought that *food safety in vegetables* meant "clean vegetables" (21%), and "organically/naturally grown / free of chemicals and pesticides vegetables" (19%).

The majority of middle-income respondents have seen food safety labels for organic (52%) and pesticide-free (29%) vegetables. They described food safety–labeled vegetables as "green-colored vegetables" (33%), "normal-sized vegetables" (17%), "fresh" (15%), and "with food safety labels" (11%).

On the other hand, the high-income group defined *food safety* as "properly handled food" (22%), "safe food" (21%), "safe to eat" (21%), "healthful food" (19%), "clean food" (10%) and "nontoxic" (7%). They thought that *food safety in vegetables* meant "organically/naturally grown / free of chemicals and pesticides vegetables" (25%), and "safe vegetables" (19%). Most of the high-income respondents have seen food safety labels for organic (49%) and pesticide-free (27%) vegetables, and there was 1 high-income respondent who has seen Eden fresh–labeled vegetables (1%). The high-income group described food safety–labeled vegetables as "fresh" (25%), "well packaged" (15%), "with food safety labels" (13%), "green-colored vegetables" (13%), "clean vegetables" (10%), "with a tendency to rot easily" (6%).

Conclusion and Recommendation

All income groups were more concerned with the visual appeal of the fresh vegetables and less with food safety. Visual appeal included the appearance, freshness, cleanliness, and freedom from physical damage. The low-income group bought vegetables from the wet market at least twice a week and had less awareness on food safety. Low-income respondents were more price

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Table 7. Respondents who have heard of the term *food safety*, by socio-economic group

Response	Low income (n=100)	Middle income (n=100)	High income (n=100)	Total
Yes	46	73	90	209
No	54	27	10	91
Total	100	100	100	300

Table 8. Respondents' definition of *food safety*, by socio-economic group

How do you define *food safety*?	Low income	Middle income	High income	Total
Safe food	19	20	19	58
Healthful food	14	16	17	47
Properly handled food	10	16	20	46
Clean food	12	26	9	47
Good food	8	4	1	13
Nontoxic	8	11	6	25
Safe to eat	2	10	19	31

Table 9. Respondents' reaction to the phrase *food safety in vegetables*, by socio-economic group

What does *food safety in vegetables* mean to you?	Low income	Middle income	High income	Total
Safe vegetables	6	9	16	31
Healthful vegetables	16	5	8	29
Properly handled vegetables	7	11	7	25
Contaminant-free vegetables	7	2	5	14
Well-packaged vegetables	3	0	7	10
Fresh vegetables	7	5	3	15
Clean vegetables	12	17	7	36
Good vegetables	12	4	0	16
Safe to eat	3	12	9	24
Organically/naturally grown / free of chemicals and pesticides vegetables	5	15	21	41

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Table 10. Food safety labels in vegetables that respondents have seen in Davao City, by socio-economic group

Food safety labels	Low income	Middle income	High income	Total
GMO-free vegetables	6	12	7	25
Chemical residue–free vegetables	6	12	7	25
Low-chemical vegetables	14	8	16	38
Organic vegetables	53	61	81	195
Pesticide-free vegetables	32	34	45	111
Eden fresh	0	0	1	1

Table 11. Description of food safety–labeled vegetables, by socio-economic group

Description of food safety–labeled vegetables	Low income	Middle income	High income	Total
Fresh	6	7	12	25
Nice-looking appearance	2	1	0	3
Big-sized vegetables	3	2	1	6
Normal-sized vegetables	0	8	1	9
Small-sized vegetables	3	0	0	3
Clean	0	2	5	7
Well packaged	1	1	7	9
Green-colored vegetables	10	15	6	31
Vegetables with no worm borers	3	0	1	4
With no chemicals	2	0	0	2
With small-sized labels	5	4	5	14
Easily rotten	0	0	3	3
With food safety labels	2	5	6	13
With white-colored label	2	1	1	4

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conscious, rarely bought lettuce, and were not particularly familiar with food safety labels and brand names. The middle-income group purchased fresh vegetables from the wet market and supermarket weekly. They defined *food safety* as "clean vegetables," and some have started to be more conscious of food safety, purchasing vegetables that were organic, food safety labeled, and well packaged. The majority of high-income respondents purchased fresh vegetables from supermarkets once a week and was most concerned with food safety. They defined *food safety* as "properly handled food" and thought that *food safety in vegetables* meant naturally grown, organic, and chemical/pesticide free. Overall, consumers from the high-income group were the most aware about food safety and are the most probable drivers for change in Davao City in order to encourage producers and retailers to take appropriate measures towards safe food.

Buyers at the supermarkets, especially the women, will most probably respond more favorably to strategies that provide information about food safety measures taken by the seller. Possible strategies for increasing the marketability of vegetables sold in supermarkets would be the inclusion of food safety labels and other forms of information about the vegetables at the retail level. This strategy, however, is not needed by retailers at the wet markets. Wet market buyers are more price sensitive and would not be too concerned about labels. Supermarket purchasers, by virtue of their higher exposure to media and information, would benefit from the labels and information given.

For the government, any attempts to promote enhanced food safety should should be directed to females, specifically the mothers who make the purchasing decision for food in the household. There will be faster acceptance of the information since the mothers are already thinking about food safety. Specifically, government agencies like the Department of Health (DOH) and the Department of Education (DepEd) should work hand in hand in informing consumers about food safety. Consumers who are more aware about the risks may demand safer vegetables and will drive vendors to take measures to respond to the need.

However, a stronger information drive for the vendors of the wet markets must be undertaken by the market authorities. Cleanliness should be enforced in the markets. Use of clean and safe water for cleaning the vegetables, hygienic vegetables stands, proper waste disposal, and proper use of latrines are only few of the many measures that wet market authorities can impose on the vendors renting the stalls. These basic steps can provide safer and cleaner vegetables to the Davao City consumers.

Since most of the consumers were more particular on the cleanliness and visual appeal of the vegetables, vendors should wash vegetables to take away residues such as dirt and biotic and nonbiotic contaminants to satisfy consumer's expectation and to generate consumer loyalty. But that in itself will not improve food safety unless the water is regularly changed and fresh potable water is used to clean the vegetables. Headed by the City Health Office and

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the Business Bureau, the city government of Davao must mandate cleanliness in all markets in the city.

Since food safety begins at the farm, implementation of a system for the detection of defects and assessment of maximum residue levels (MRLs) of chemicals on vegetables in the field should be considered. Also for consideration is the adoption of good agricultural practices (GAP) and good handling practices (GHP). Intervention coming from the government, particularly the Department of Agriculture (DA) and Department of Health (DOH), is highly recommended. Food safety at postharvest must also become part of the total intervention as food contamination may also occur in transit.

Overall, while most consumers are not particularly concerned about food safety in vegetables, it becomes the role of government, through the health agencies and the market authorities, to mandate vendors, wholesalers, and producers of vegetables to protect the health of the consumers by taking measures to ensure food safety.

Note

1. A *talipapa* / *laray* is a small community market which sources their fresh produce from the central wet market and backyard gardens.

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