

Consumers' Valuation on Food Safety Attributes (Penilaian Pengguna terhadap Ciri-ciri Keselamatan Makanan)

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ABSTRACT

The objective of this study is to determine the consumers' valuation or willingness to pay (WTP) for the safety attributes of cabbage. The survey was conducted in Klang Valley, Malaysia from September to November 2019 involving 505 respondents. This study employed the discrete choice experiment (DCE) and found that the important safety attributes of cabbage demanded by consumers were appearance, followed by the type of production system, cabbage with myGAP certification and the type of market (point of purchase of cabbage). The sociodemographic variables such as age, income and education level also can influence the WTP for the safety attributes of cabbage. The findings suggested that the older consumers and the consumers with higher income and education were willing to pay more for safety attributes of cabbage. Thus, these findings can be utilized by the producers and marketer to design appropriate production and marketing strategies to meet the demand from these group of consumers and consequently can be translated into business opportunities.

Keywords: Organic vegetables; food safety attributes; willingness to pay; certified cabbage; discrete choice experiment
JEL: Q100, Q130

ABSTRAK

Objektif kajian ini adalah untuk menentukan penilaian pengguna atau kesanggupan membayar (WTP) bagi ciri-ciri keselamatan makanan untuk kubis. Kaji selidik itu dijalankan di Lembah Klang, Malaysia dari September hingga November 2019 melibatkan 505 responden. Kajian ini menggunakan eksperimen pilihan diskret (DCE) dan keputusan menunjukkan bahawa atribut keselamatan makanan yang penting bagi kubis yang dituntut oleh pengguna adalah keadaan fizikal kubis, diikuti oleh jenis sistem pengeluaran kubis, kubis yang mendapat pensijilan myGAP dan jenis pasaran (tempat pembelian kubis). Pembolehubah sosiodemografi seperti umur, pendapatan dan tahap pendidikan juga boleh mempengaruhi WTP untuk atribut keselamatan makanan untuk kubis. Penemuan menunjukkan bahawa pengguna yang lebih berumur dan pengguna yang berpendapatan tinggi dan berpendidikan tinggi sanggup membayar lebih untuk atribut keselamatan makanan untuk kubis. Oleh itu, penemuan ini boleh digunakan oleh pengeluar dan pemasar untuk merekabentuk strategi pengeluaran dan pemasaran yang sesuai untuk memenuhi permintaan daripada kumpulan pengguna ini dan seterusnya boleh diterjemahkan kepada peluang perniagaan.

Kata Kunci: Sayuran organik; atribut keselamatan makanan; kesanggupan membayar; kubis yang mempunyai pensijilan; eksperimen pilihan diskret

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INTRODUCTION

Food safety is the prevention of contamination and foodborne illnesses (Paul 2017). Recently, there is significant changes in terms of demand of food product. Food safety issues are receiving greater attention from the consumers. This new

awareness is related to the improvement in income as well as urbanization. Furthermore, more attention was given due the links between food intake and consumers' health are increasingly recognized. Consumers are placing more emphasis on choosing food with certain attributes such as safety, quality, health and convenience. Food safety is considered as one of the important criteria considered by the consumers for the selection of food product (Idiaye et al. 2020; Bismark & Ali 2021)

The increases in income and rapid urbanization have led to changes in consumer preferences. As a result, consumers are willing to pay premium price for food products (Wang et al. 2022; Idiaye et al. 2020; Bismark & Ali 2021). For example A study by Hanis et al. (2010) suggested that the consumers were paying greater attention towards the quality and food safety as the income increases. Similarly, a study by Britwum and Yiannaka (2019) and Indrawan et al. (2021) suggested that consumers were willing to pay more for products with certification and with food safety label.

However, the excessive pesticide residues detected in fresh produce has caused serious concerns by the consumers. Based on the reports from the Ministry of Health in 2015, Singapore has blocked the entry of several vegetables from Malaysia due to the excessive use of pesticides. Similar incidences have been reported in 2017 and 2018 in which several vegetables imported from Malaysia were rejected due to the excessive usage of pesticides (Ministry of Health 2017; Ministry of Health 2018). Similar findings were reported by Yang Farina et al. (2017) in which several vegetables from Cameron Highlands were contaminated with the pesticides and these vegetables were found in the supermarkets. Recently, in 2020, according to report prepared by Singapore Food Agency (2021), it was reported that the import of leafy vegetables from Cameron Highlands has been limited and halted due to a high level of pesticide residues. These incidences sparked attention from many parties in Malaysia.

Considering the issues above coupled with the changing lifestyle of the consumers towards a healthy lifestyle, improving food safety in Malaysia is crucial. Enhancing the food safety standards requires additional costs. Therefore, it is essential to assess the extent of consumers' willingness to pay for the improvement in food safety. It is also crucial to comprehend the consumers buying behaviour for fresh produce as this information will help the farmers to respond to the variations and changes in consumer preferences. Thus, the objective of this study is to determine the consumers' valuation or willingness to pay for cabbage safety attributes and to identify the socio demographic factors that can influence their valuation or willingness to pay for safety attributes of cabbage. Cabbage was selected due to its highest per capita consumption in Malaysia (Department of Statistics Malaysia 2020)

This study contributes to the new literature in terms of food safety attributes demanded by the consumers. There were few studies in Malaysia that evaluated the food attributes, but none of them entirely focused on the food safety attributes individually. For instance, in a study by Abdul Hadi et al. (2010), the authors have discussed the demand for food safety attributes of vegetables in Malaysia but the discussion appeared to center around the production system of vegetables. Contrary, the present study emphasizes on the food safety attributes and are discussed individually. Further, in order to reflect the novelty of the study on food safety attributes, the MyGAP and type of market were added in this study.

LITERATURE REVIEW

FOOD SAFETY CONCEPT

Food Agriculture Organization (2003) defines food safety as food that is free from all hazards that may be injurious to the health of the consumer whether chronic or acute (FAO/WHO 2003). Similarly, Paul (2017) defined the food safety as the conditions and practices that conserve the quality of food that minimize the contamination and foodborne illnesses. While Haghiri (2016) defined the food safety as minimizing the misuse of food additives and contamination while food quality is defined as quality attributes of the product such as appearance of the product (freshness), colour, flavour, texture and nutritional value of the product. A typical food safety measurement used at the farm level is based on the amount of chemicals and pesticides used during the production of agriculture produce. This is common for vegetables and fruits commodities. Most of the studies used organic and certifications as the example of safety attributes for agriculture produce (Thai et al. 2017; Birol et al. 2015, Sirisupluxana & Bunyasiri 2017; Wongprawmas & Canavari 2017). Food quality and food safety are receiving greater attention by consumers which poses to the challenges to the supply chain actors to adapt with the changes of consumer demand.

FOOD SAFETY ATTRIBUTES

A wide range of study have been conducted to determine the consumer demand for food safety attributes. According to the previous studies production system (organic or inorganic), certifications, traceability labels and the country of origin are among the most important indicators of safety for a variety of food particularly for fresh products (Meyerding et al. 2019; Thai et al. 2017; Berges et al. 2015; Owusu & Anifor 2013; Birol et al. 2015, Sirisupluxana & Bunyasiri 2017; Wongprawmas & Canavari 2017)

APPEARANCE

Freshness is frequently cited as one of the most significant quality attributes influencing the decision of consumers to buy fresh products (Krystallis & Arvanitoyannis 2006). According to Kennedy et al. (2009), mostly, product appearance (which comprises colour and the physical form of fresh product) were utilized in order to evaluate the freshness of fresh produce. Similarly, a study by Hanis et al. (2010) also has included appearance as one of the attributes to evaluate consumers' willingness to pay for food safety attributes of vegetables in Malaysia.

PRODUCTION METHOD

The method of production differentially impacts purchase decisions across consumer studies. Method of production comprises of conventionally produced (which uses pesticide and insecticide in production of fruits and vegetables and organic (chemical-free production of vegetables). According to Anacleto and Paladini (2014) food is considered as organic if it's production in compliance with certain standards. Organic farming contributes to sustainable development in terms of food safety and quality. According to Wang et al. (2019), the consumers are willing to pay for organic produce due to its perceived safety value. Similarly, a study by Annunziata et al. (2009) indicated that the increase in the demand of organic food due to consumer concerns on health issues. Many of the studies classified organic production system as one of the safety attributes that can affect the consumers' demand.

CERTIFICATION

The agriculture produce relies on chemical fertilizers and pesticides, however, nowadays consumers are paying more attention to their health due to the increase in income and urbanization. Thus, this create the awareness and demand to enhance the food safety of agriculture produce. Certification requires additional cost. A study by Bismark et al. (2019) indicated that consumers are willing to pay premium price for certified vegetables to due to the health concern. Similarly, Birol et al. (2015), Sirisupluxana and Bunyasiri (2017) and Wongprawmas & Canavari (2017) also demonstrated that certification as an important safety attribute to the consumers.

WILLINGNESS TO PAY FOR FOOD SAFETY ATTRIBUTES

Studies have suggested that consumers were giving more value for food safety attributes of products (Wang et al. 2022; Idiaye et al. 2020; Bismark & Ali 2021; Loureiro & Umberger 2007; Tonsor et al. 2009). Due to the changes in consumers demand, studies in Asia have been focusing to assess the WTP of the consumer towards food safety (Thai et al. 2017; Chen et al. 2015; Yin et al. 2019). For example, research by (Ortega et al. 2011) discovered that Chinese consumers willing to pay premium price for food safety attributes of pork as well as for certified food. Yu et al. (2014) revealed that the consumers in China were willing to pay premium price for green food. Similarly, Birol et al. (2015) also demonstrated that Indian consumers in Mumbai were ready to pay more for grapes with certification as compared to uncertified grapes. In a study that employs the DCE to evaluate the consumers demand for food safety attributes of vegetables in Thailand, (Wongprawmas & Canavari 2017) concluded that the consumers were willing to pay more for the vegetables that have been certified. The finding further corroborates with earlier study conducted by Lippe et al. (2010) in which the consumers willing to pay premium price for safe and certified foods relative to the uncertified food. The study further revealed the factors that can influence the WTP include education, income and product quality. Recently, a study by Etuah et al. (2021) also found that the consumers in Ghana were willing to pay 31%-50% more for certified organic vegetables in Ghana.

In addition to food safety attributes, the quality attributes also can influence the consumers' willingness to pay. For instance, studies by (Lippe & Isvilanonda 2010) and (Gorton et al. 2009) in Thailand revealed that freshness was the most influential factors in determining their purchase decision. Colour, presentation, the convenient location of a retail outlet, maturity, and uniformity are the other significant influencing factors on consumers' WTP. The DCEs have found widespread use in assessing both the consumers' WTP for non-market goods and the value of food attributes (Burton et al. 2001; Alfnes 2004; Loureiro & Umberger 2007). This approach is more suitable in conditions where the data in the market is unreliable or non-existent (Tonsor et al. 2009).

DISCRETE CHOICE EXPERIMENT

The discrete choice experiment (DCE) is derived from the Random Utility Theory (RUT) and Lancaster's theory of characteristics (Lancaster 1966). DCEs is capable to simulate consumers' actual purchasing decisions by evaluating the utility of attributes in various combinations (Liu et al. 2020). The utility of a product can be separated into the benefits of a product's attribute and the consumers will choose the option that give them highest utility. The DCE can simulate real-life purchase scenarios and helps the researchers to include several attributes of a product (Lusk et al. 2003; Tonsor et al. 2009). The respondents are required to make a tradeoff between the attributes and will choose the option that give them highest level of utility (James & Burton 2003). The DCE is able to uncover trade-offs made when choosing among multiple

alternatives (Lizin et al. 2022). Several studies had utilized discrete choice experiment to determine the consumer preferences towards the food safety attributes (Ortega et al. 2011; Yu et al. 2014; Birol et al. 2015; Wongprawmas & Canavari 2017). Comparatively to other techniques, DCE offers several advantages. For the most part, DCE emphasizes on trade-offs between the various considered attributes and their relevant attributes, and not exclusively on the question of payment or quantitative valuation. The DCE also allows the inclusion of several attributes at the same time and required the respondents to make a tradeoff between the attributes and it is assumed that the respondents will choose the option that give them highest level of utility.

SOCIODEMOGRAPHIC VARIABLES

Several studies have highlighted that factors that can influence the willingness to pay for a product can be categorized into two categories namely factors related to the products and factors related to the consumers. The product attributes such as label, packaging and price are the example of factors related with the product. While education, age, income, occupation, gender, and household size are the consumers factors that can influence the willingness to pay for a product (Idiaye et al. 2020; Kokthi et al. 2015).

METHODOLOGY

CONCEPTUAL MODEL

DCEs have been used for many years as a marketing tool to evaluate consumer preferences for different types of product attributes. The method is based on a stated preference in which the respondents are requested to select one of several options based on their preferences. In this study, the marginal WTP for various safety attributes of cabbage in Malaysia was estimated using the DCE. The safety attributes such as appearance, production system, type of market and myGAP certification have been included in this study. Respondents were requested to select their most preferred option and respondents were assumed to select the option that can maximize their utility. A random utility model based on Lancaster's characteristics theory of value was used to represent the utility of the food safety attribute of cabbage. The random utility model of respondent i selecting option j is represented by:

$$U_{ij} = X_{ij}\beta + \varepsilon_{ij} \quad (1)$$

where $X_{ij}\beta$ represents the deterministic component of the utility, while the unobserved component of the utility is the error term ε_{ij} . The vector, X_{ij} , represents the safety attributes considered in this study and β is a vector of the parameters to be estimated. The possibility the respondent i selects j^{th} alternative from the choice set S_i is:

$$P(j) = P(X_{ij}\beta + \varepsilon_{ij}) \geq (X_{ik}\beta + \varepsilon_{ik}); \text{ for all } k \in S_i \quad (2)$$

Herein, the choice set S_i contains several levels of safety attributes considered in this study. Equation (1) was estimated by using the conditional logit model (CL). In order to determine the sociodemographic factors that can influence the willingness to pay, the term interaction was used in which the sociodemographic variables such as age, education and income were interacted with choice attributes in this study.

ATTRIBUTES AND LEVELS

The selection of attribute and level are importance phases in the development of instruments in the DCE. It needs a particular variation in its design in order to provide choice sets for the hypothetical scenarios. Each attribute has its levels, and these levels will influence individual preferences in making decision (Lancsar & Louviere 2008). In order to estimate the demand for food safety attributes for cabbage, it is however impossible to incorporate all of these food safety attributes. The selection of food safety attributes was done through a focus group discussion (FGD), where a total of 29 participants that consists of various demographic profiles participated in order to reflect actual Malaysian population. During the FGD, the participants were also asked to choose the attribute levels to be used in the development of questionnaire. From the FGD, it was found that appearance, production system, type of market, myGAP certification, and price were the most significant safety attributes preferred by the consumers. The appearance of cabbage represents the physical form of cabbage. The production system attribute refers to the method of production for cabbage. The type of market refers to the place where the cabbage were sold and myGAP certification refers to the Malaysian good agricultural practices' certification. The basis of the price determination was based on the market price during the period of study which varies according to the attributes of the cabbage as well as the place where the cabbages were sold. For example, during the period of study the market price for cabbage was RM3 per kilogram at wet market and the price was slightly higher in supermarket such as at Jaya Grocer and Giant which can be reached up to RM12/kg if it was organic. Thus, in order to capture the consumers' valuation on this

safety attributes of cabbages, the range of price from RM3/kg to RM12/kg was used in this study. In DCE price is added to allow the derivation of monetary value of the safety attributes considered in this study. The summary of the safety attributes selected by the consumers during the FGD were used and are presented in Table 1.

TABLE 1. Attributes and levels of cabbage

| Attribute | Level | Description |
|---------------------|-----------------|-------------------------------------|
| Appearance | Wholesome | Fresh and no blemishes |
| | Slightly damage | Existence of blemishes |
| Production System | Organic | Organic cabbage |
| | Conventional | Inorganic cabbage |
| Type of Market | Supermarket | Cabbage sold at supermarket |
| | Wet market | Cabbage sold at wet market |
| MyGAP Certification | Certified | Cabbage certified with MyGAP |
| | Not certified | Cabbage without MyGAP certification |
| Price | RM 12 | Price/kg |
| | RM 9 | Price/kg |
| | RM6 | Price/kg |
| | RM3 | Price/kg |

SURVEY DESIGN AND DATA COLLECTION

The study was conducted in the Klang Valley, where self-administered questionnaires were used to collect the data. The population in Klang Valley was around 7.5 million and using the Slovin's formula, by minimum 400 respondents were required in order to represent the population in Klang Valley however, we managed to get 505 respondents in this study. The survey was conducted in between September to November 2019. Using a choice experiment, the respondents were asked to choose the option that can maximize their utility from orthogonally designed choice sets. Each choice set contained alternative types of cabbage with different levels of appearance, production system, types of market, myGAP certification and price attributes. Using the MktEx procedure in SAS 9.4. 16 choice sets have been obtained as an efficient design. The example of a choice set that has been used in this study is presented in Table 2.

TABLE 2. Example of a choice set

| OPTION | A | B | C |
|---------------------|-------------|-----------------|----------------------------------|
| Appearance | Wholesome | Slightly damage | Neither A nor B is preferred. |
| Production System | Organic | Conventional | |
| Type of Market | Supermarket | Wet market | |
| myGAP Certification | Certified | Not certified | |
| Price | RM 9 | RM 3 | |
| Option | | | |

MODEL SPECIFICATIONS AND ESTIMATION PROCEDURES

There were two (2) models have been included in this study namely Model 1 and Model 2. Model 1 was used to determine the consumers' preferences and willingness to pay for food safety attributes of cabbage. On the other hand, Model 2 was used identify the demographic factors that can influence the willingness to pay for cabbage safety attributes.

MODEL 1

In order to answer the objective of the study, Model 1 was used in order to determine the consumers' preferences for food safety attributes of cabbage. The Model 1 can be specified as follows:

$$U_{ij} = \beta_{oi} + \beta_{1i}APP_WHOLESOME_j + \beta_{2i}PS_ORGANIC_j + \beta_{3i}TM_SUPERMARKET_j + \beta_{4i}MYGAP_CERTIFIED_j + \beta_{5i}PRICE_j + \varepsilon_{ij} \quad (3)$$

Where U_{ij} is the utility for i th individual; j is option A.B.C; β_{oi} is an alternative-specific constant (ASC) refers to the 'neither' option.

The description of the variables are as follows in Table 3

Table 3. Description of variables

| Variables | Description |
|----------------|----------------------------------------------------------------------------------------|
| APP_WHOLE SOME | Coded as 1 if the appearance of the cabbage is good; 0 otherwise |
| PS_ORGANIC | Coded as 1 if the cabbage is organic; Coded as 0 if the cabbage is inorganic |
| TM_SUPERMARKET | Coded as 1 if cabbage sold in supermarkets, 0 otherwise |
| MYGAP_CERT | Coded as 1 if cabbage certified with MyGAP, 0 if the cabbage is uncertified with MyGAP |
| Price | retail price of cabbage (RM/kg). |

The equation 3 above then was estimated using conditional logit. The estimated coefficients obtained from equation 3 were used to calculate the marginal willingness to pay using equation (4) as follows:

$$WTP = -\beta_k / \beta_p \quad (4)$$

Where

WTP refers to marginal willingness to pay

β_k is the estimated coefficient for the k food safety attributes of cabbage

β_p is the estimated coefficient for the monetary attribute (price)

In order to generate 95 per cent confidence intervals for the WTP, the Krinsky-Robb parametric bootstrapping technique was used using STATA15 (Hole 2007). Referring to (Krinsky & Robb 1986), a total of 1,000 measurements were obtained at random from normal multivariate distributions using estimates and variance-covariance matrices that are derived using estimation procedures, and the results were analyzed.

MODEL 2

One of the objectives of this study is to identify the demographic factors that can influence the willingness to pay for cabbage safety attributes. In order to answer the second objective of the study, Model 2 was developed. Income, age and education were selected to interact with the safety attributes as these demographic factors have been proved as the important variables that can influence the consumers' willingness to pay (Birol et al. 2015; Nandi et al. 2016; Wang et al. 2019). In order to answer the objective of this study, the dummy variables have been generated for four age groups (Age2029 = 1 if a respondent is between 20 to 29, otherwise Age2029 = 0; Age3039 = 1 if a respondent is between 30 to 39, otherwise Age3039 = 0; Age4049 = 1 if a respondent is between 40 to 49, otherwise Age4049 = 0; Age5059 = 1 if a respondent is between 50 to 59, otherwise Age5059 = 0); three education groups (Edu_Primary = 1 if a respondent has primary education, otherwise Edu_Primary = 0; Edu_Secondary = 1 if a respondent has secondary education, otherwise Edu_Secondary = 0; Edu_Tertiary = 1 if a respondent has tertiary, otherwise Edu_Tertiary = 0) and three income categories (Inc_Low = 1 if a respondent's monthly income is less than RM4000, otherwise Inc_Low = 0; Inc_Med = 1 if a respondent's monthly income is in between RM4001 and RM9000, otherwise Inc_Med = 0; Inc_High = 1 if a respondent's monthly income is more than RM9000, else Inc_High = 0); After that, the interaction terms of these dummy variables with independent variables have been added to the original model specification equation.

RESULTS

Table 4 presents the socio-demographic profile of the respondents. In terms of age, about 40.6% of the respondents were in between 20-29 years old, 24.2% were in between 30 to 39 years old, 16.8% were in between 40 to 49 years old and 18.4% of the respondents were in between 50 to 59 years old. In terms of gender, the majority of our respondents were female (65.3%) and 34.7% were male. The majority of the respondents were Malay (79.6%), followed by Chinese (10.3%), Indian (7.9%), and Bumiputera (2.2%). The result also suggested that 57%, of the respondents were married, 41.2% were single and 1.8% of them were widow. More than half of the respondents had tertiary education (62.8%), and 33.2% of them had secondary education and only 4% of the respondents had primary education (4%). In terms of employment, about 42.9% of the respondents were working with the private sector, while 23.6% of them were working with the government. In terms of income, the result showed that about 46.5% of the respondents had a household income of less than RM4000 per month, followed by RM4001-RM9000 (39.8%), and greater than RM9000 (13.6%). The result also suggested that about 48.3% of the respondents had the household size between 4 to 6 followed by 1 to 3 (40%), 7 to 9 (9.7%) and 10 to 12 persons (1.9%).

TABLE 4. Socio demographic profile of respondents

| Demographic factors | Categories | Frequency | Percentage |
|-----------------------------|------------------------------|-----------|------------|
| Group of Age (years old) | 20-29 | 205 | 40.6 |
| | 30-39 | 122 | 24.2 |
| | 40-49 | 85 | 16.8 |
| | 50-59 | 93 | 18.4 |
| Gender | Male | 175 | 34.7 |
| | Female | 330 | 65.3 |
| Ethnic | Malay | 402 | 79.6 |
| | Chinese | 52 | 10.3 |
| | Indian | 40 | 7.9 |
| | Bumiputera Sabah dan Sarawak | 11 | 2.2 |
| Marital status | Single | 208 | 41.2 |
| | Married | 288 | 57.0 |
| | Widows | 9 | 1.8 |
| Education | Primary | 20 | 4.0 |
| | Secondary | 168 | 33.2 |
| | Tertiary | 317 | 62.8 |
| Employment | Government sector | 119 | 23.6 |
| | Private sector | 217 | 42.9 |
| | Full-time student | 96 | 19.0 |
| | Unemployed | 14 | 2.7 |
| | Housewife | 37 | 7.3 |
| | Retiree | 22 | 4.3 |
| Income (RM/month) | Low | 235 | 46.5 |
| | Medium | 201 | 39.8 |
| | High | 69 | 13.66 |
| Household number | 1-3 | 202 | 40.0 |
| | 4-6 | 244 | 48.3 |
| | 7-9 | 49 | 9.7 |
| | 9-12 | 10 | 1.9 |

ESTIMATION RESULTS FROM CONDITIONAL LOGIT

In order to determine the consumers' willingness to pay for food safety attributes of cabbage, Model 1 and Model 2 have been estimated using conditional logit. The estimation results for Model 1 is presented in Table 5. As can be seen from the table, the coefficient values obtained from the estimated results for food safety attributes of cabbage; i.e. appearance, production system, type of market and myGAP certification were all positive and statistically significant at the 1 % level indicating that the respondents favour an improvement attribute level instead of status quo levels used in the study. Alternative-specific constant (ASC) captures the average effect on utility of the status quo. The ASC for the status quo was statistically significant and negative indicating that, on average, respondents for this study were significantly likely to choose any option (A or B) that suggesting improvements in the food safety attributes of cabbage. The positive signs for wholesome appearance coefficient implied that Malaysian consumers preferred cabbages with wholesome appearance relative to slightly damage cabbage. The results also indicated that Malaysian consumers preferred organic (rather than conventional- inorganic vegetables), sold at the supermarket rather than wet market and cabbage with myGAP certification rather than not certified cabbages. The price coefficient was negative, demonstrating that any increment in the price will reduce consumers' utility. The highest coefficient was 0.5417, indicating that wholesome cabbage was the most preferred safety attribute demanded by the consumers, followed by organic cabbage (0.5338), cabbage certified with myGAP (0.3632), and cabbage which sold at the supermarket (0.1706).

TABLE 5. The Estimation Result for Model 1

| Independent Variables | CL |
|-------------------------------------|----------------------|
| Alternative Specific Constant (ASC) | -2.9092 (0.0718) *** |
| Wholesome Appearance | 0.5417 (0.0366) *** |
| Organic Cabbage | 0.5338 (0.0303) *** |
| Super Market | 0.1706 (0.0302) *** |
| myGAP Certification | 0.3632 (0.0263) *** |
| Price | -0.1702 (0.0049) *** |

Number of Observation = 24240

Log likelihood = -5608

AIC (Akaike information criterion) = 11229

Note: The standard errors are in parentheses. All estimates at 1 % level are statistically significant. The presented model was estimated using the PROC MDC procedure (Inc., 2019).

WILLINGNESS-TO-PAY FOR FOOD SAFETY ATTRIBUTES OF CABBAGE

Table 6 presents the marginal willingness to pay (MWTP) for food safety attributes of cabbage. The findings suggested that the consumers were willing to pay for an additional RM3.18 for the cabbage with wholesome appearance relative to the cabbage with slightly damage appearance. Thus, this finding indicated the Malaysian consumers were willing to pay for premium price for the good appearance of cabbage and suggested that the consumers considered appearance as the most preferred safety attributes preferred. In terms of production system attributes, the result suggested that the consumers were willing to pay additional RM3.13 for organic cabbages relative to the inorganic cabbages. This suggested that organic is one of the important safety attributes demanded by the consumers. The result also suggested that the consumers preferred the cabbages sold at the supermarkets and willing to pay for an additional RM1.00 to have the cabbage sold at supermarket compared to the cabbages sold at the wet market. In terms of certification, the consumers were willing to pay additional RM2.13 for cabbages with the myGAP certification as compared to the cabbages without certifications. It suggests that the certification was one of the important attributes in evaluating the safety attribute. This is similar to the finding reported by Amfo et al. (2018) in which the consumers in Ghana were willing to pay premium price for certified vegetables.

TABLE 6. Marginal willingness to pay (MWTP) for food safety attributes of cabbage

| Attribute Levels | MWTP | Standard Error ¹ |
|----------------------|------|-----------------------------|
| Wholesome Appearance | 3.18 | 0.2193 |
| Organic Cababge | 3.13 | 0.2091 |
| Super Market | 1.00 | 0.1811 |
| myGAP Certification | 2.13 | 0.1607 |

The results for MWTP for Model 2 are presented in Table 7. In the interaction model (Model 2), the highest willingness to pay value obtained for food safety attribute of cabbage was RM4.35 represented by organic cabbage attributes and tertiary education background. The result suggested that the consumers with higher education level were willing to pay additional RM4.35 for the organic cabbage as compared to the consumers will lower education level. In terms of appearance, the result suggested that the high-income consumers were putting additional RM3.99 value for the wholesome appearance of cabbage as compared to the low-income consumer. In terms of organic vegetables, the results suggested the older consumers who were in between 30 and 39 years old and 50 to 59 years old were willing to pay additional RM1.34 and RM1.94 respectively for organic cabbage as compared to the younger consumers who were between 20 and 29 years old.

In terms of certification, the results also suggested that the consumers within the age group of 30 and 39 years old were putting more value for certified cabbage relative to younger age group of consumers (in between 20 and 29 years old) with the additional willingness to pay value of RM2.18. For the certified cabbage and the consumer with secondary and tertiary education levels, their willingness to pay were RM2.52 and RM2.89, respectively. Finally, consumers earning higher income were willing to pay an additional of RM2.46 for cabbage certified with myGAP relative to the consumers who are at a lower-income level.

TABLE 6. Marginal willingness to pay for interaction terms for cabbage

| Attribute Levels x Demographic Categories | MWTP | Standard Error ² |
|-----------------------------------------------------|--------|-----------------------------|
| Appearance wholesome x Income High | RM3.99 | 0.3545 |
| Production system organic x Age (30-39) | RM1.34 | 0.3035 |
| Production system organic x Age (50-59) | RM1.94 | 0.2678 |
| Production system organic x Education Tertiary | RM4.35 | 0.2882 |
| myGAP certification certified x Age (30-39) | RM2.18 | 0.2831 |
| myGAP certification certified x Education Secondary | RM2.52 | 0.3137 |
| myGAP certification certified x Education Tertiary | RM2.89 | 0.2933 |
| myGAP certification certified x Income High | RM2.46 | 0.2219 |

DISCUSSION

This study investigates consumers' preferences and willingness to pay (WTP) for food safety attributes of cabbage. Overall, the findings revealed that Malaysian consumers were willing to pay more for the safety attributes of cabbage. Appearance, organically grown and certified cabbage as well as point of purchased were considered as the important safety attributes by the consumers. The results were consistent with the previous research on estimating the WTP for food safety attributes of vegetables in Thailand and Pakistan in which the consumers were willing to pay premium price for certified and organic vegetables (Wongprawmas & Canavari 2017; Khan et al. 2019). The study by (Hanis et al. 2010), in fact, revealed that Malaysian consumers were keen on paying as much as RM8.70 more for the food safety attribute of leafy vegetables. Similarly in China, the consumers preferred safer vegetables and are willing to spend more to acquire them (Zhang et al. 2018a). The findings suggest that the appearance, organic, certified cabbage and the place where the cabbage is sold can influence the willingness to pay. In terms of types of production system and certification, the findings are consistent with most of previous studies as these two attributes reflects the safety attributes of cabbage. In terms of types of market, the findings suggest that the consumers are willing to pay for cabbage sold at supermarket relative to wet market as the cabbage

sold at supermarkets are considered safer than those sold at fresh markets from the consumers' point of view. Furthermore, pre-washed and clean vegetables are always sold at supermarkets. The willingness to pay for the safety attributes of cabbage varies with age, income and education level. As demonstrated in this study, older consumers (between 30 to 59) tend to place greater emphasis on food safety issues compared to younger consumers (between 20 to 29). This result is consistent with research by (Muhammad et al. 2015) that older consumers were keen on spending more for organic vegetables. One of the possible reasons to attribute is that as the consumers are getting older, they are paying greater attention to their health compared to the younger people. Education and income level also influence consumers' WTP, in addition to age, with those having tertiary education background and earning higher income are keen paying the additional cost for food safety attributes of cabbage as demonstrated in studies by (Khan et al. 2019) and (Zhang et al. 2018b). As income and education increase, they have a greater awareness of health, leading to a higher willingness to pay. In other words, knowledge and understanding can influence the consumers' valuation on food safety attributes. This is also in line with the findings suggest by Shafie and Rennie (2012) in which they indicated the consumers for certified and organic vegetable tend to be educated and were from higher social class.

CONCLUSION

By using DCE, the study examined the consumers' demand for food safety attributes of cabbage. Five safety attributes were tested namely appearance, production system, MyGAP certification, type of market and price. The consumers' preferences on food safety attributes of cabbage have been assessed, and the marginal willingness to pay for the demanded food safety attributes are also estimated. The data collection was done in Klang Valley, involving 505 respondents. The important safety attributes of cabbage demanded by consumers were appearance, followed by the type of production system, myGAP certification and the type of market (point of purchase). The findings also suggested that age, education and income also can influence the willingness to pay for safety attributes of cabbage.

The older generations are likely to emphasize more on food safety issues than the younger generation (between 20 to 29). Also, consumers earning high income and possessing tertiary education had higher WTP for cabbage with food safety attributes. The results indicate that the consumers are paying more attention to a safer product. Therefore, the food safety policies should be enhanced in order to meet the demand of the consumers and consequently can contribute to improve the society welfare. Because consumers are willing to pay more for safer attributes, if the industry and farmers can respond effectively to these changes, then it can be translated into business opportunities. The certification programme for agriculture produce should be supported in order to respond to the consumers' demand since the consumers were willing to pay more for the certified vegetables. The government agencies should have a vital role in distributing information and knowledge on food safety and implementing and controlling the use of food safety labels. Therefore, the government should continue its role to enhance food safety standards. The results suggest that older people with tertiary education and high income are willing to pay more for safer attributes of cabbage. The findings will help the agri-food industry in Malaysia to identify and understand the factors that can influence the consumers WTPs. Thus, this will help the industry to respond to the changes in consumers' demand and preferences.

NOTES

- ¹ The corresponding standard errors are estimated using the Krinsky-Robb parametric bootstrap method, which is implemented in the STATA 15 statistical analysis software (Hole 2007).
- ² The corresponding standard errors are estimated using the Krinsky-Robb parametric bootstrap method, which is implemented in the STATA 15 statistical analysis software (Hole, 2007).

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