WILLINGNESS TO PAY FOR THE CONSUMPTION OF GREEN FOOD PRODUCT AMONG HOUSEHOLDS

Zuroni Md Jusoh[1] and Nizam Ahmat

Abstract

Green food refers to food that is safe to eat, good quality, healthy, concerned about animal welfare and is produced under the principles of sustainable development. The objective of this study is to determine the ability of households to pay according to the attributes of green food product, and to estimate the implicit price for each attribute that is modelled. Data collection was carried out in the Klang Valley from June until August 2016 by using convenient sampling method. A total of 309 respondents were selected. Data were collected using questionnaires distributed to households in the Klang Valley area, namely the Federal Territory of Kuala Lumpur, Putrajaya, Ampang and Subang Jaya. Data were analysed using SPSS version 21 for descriptive and inferential test while SAS and 9.0 LIMDEP logit 3.0 was used to analyse the household's willingness to pay (WTP) through the Choice Model (CM) technique. The study found that on average, consumers are willing to pay RM3.46 for the reduction of risk to human health and willing to accept the compensation of RM1.723 for the environmental impact of the chicken production process. It explains that on average, households would be very concerned about the risk factors to human health and the impact on the environment in green food choices for a healthy lifestyle. Meanwhile, the external characteristic was not significant and did not affect households in sustainable food choices. Therefore, the food manufacturers and the government should take the initiative to apply these attributes in sustainable food production so that a healthy lifestyle can continue to be practised by the consumers.

Keywords: Willingness to pay, Green food, Choice Model

Introduction

Sustainable food or green food refers to food that is safe to eat, good quality, nutritious, healthy, concerned about animal welfare and is produced under the principles of sustainable development (Liu, 2003). This green food covers Genetically Modified Organisms (GMOs), Environmental Management System (EMS) and organic foods. Food consumption patterns have changed the sustainable society lifestyle due to rapid economic development during the past two decades with the growth rate of about 6 per cent per year since 2000. This change has resulted in the development of various agricultural products such as Genetically Modified Organisms (GMOs), Environmental Management System (EMS) and local organic produce or crops. This, in turn, has led to rapid growth in the food and agricultural industry and increasing demand for agricultural products (Golnaz et al., 2012). In addition, rapid world development is also causing change from every angle, including the economy and the world market.

Meanwhile, dietary consumption patterns in Malaysia has also changed with the rapid economic development over the past two decades, with economic growth at the rate of 6 per cent a year since 2000 as a result of the rapid growth of the agricultural and food industry as well as the demand for agricultural products (Phuah et al., 2011).

[1] Department of Resource Management and Consumer Science, Faculty of Human Ecology, University Putra Malaysia. Corresponding Author: zuroni@upm.edu.my

The rapid growth of personal income of the population and the increase in population has been changing the characteristics of the consumer's desired food choices towards one with a healthier lifestyle and nutritious (Phuah et al., 2011). However, in Malaysia, the consumer is found to be less concerned about food safety concerns although they have a higher level of consciousness in health awareness (Shaharudin et al., 2010).

Agricultural products have been developed with value that was added through higher prices. To handle the increase in the cost of living due to practising a healthy lifestyle, are households willing to pay more for the consumption of green food products? An accurate assessment of non-market goods and services is required to estimate consumer's willingness to pay (WTP) by using the choice model method (CM).

Research Objective

The objective of this study is to determine the consumer's willingness to pay according to the attributes of green food products, and to estimate the implicit price for each attribute that is modelled.

Literature Review

Consumers view green food as more expensive than ordinary food (Radman, 2005; Lea & Worsley, 2005). The majority of consumers see price as a key factor in the purchasing process. They feel that green food should not be more expensive than conventional food (Magnusson et. al., 2001). This shows the need for more value for the money that is used to explain the high prices for green food (Padel & Foster, 2005). Studies have shown that most consumers will buy green food if the price is cheaper (Radman, 2005; Lea & Worsley, 2005). Fotopoulos and Krytalis (2003) said that a positive attitude toward green products will increase the consumer's willingness to pay.

Specifically, the consumer agrees to pay more for green food even with the high price (Zeinab & Seyedeh, 2012). In fact, the more concern a consumer has for the environment, the more inclined the consumer will be towards green food purchases. However, high prices will curb the ability of consumers to have it. It has been proven through research that consumers will be faced with the decision to choose between buying green food and saving the money or spending their money to buy luxurious items (Tarkiainen & Sundqvist, 2005).

Methodology

Choice Model

The Choice Model Method (CM) was used in this study. The purpose of CM is to identify the marginal value of green food attributes. The CM is a class of stated preference technique but has the unique flexibility to evaluate both alternative options and the marginal values of non-market attributes. With CM, it is possible to estimate the value of the individual attributes that make up an environmental good. The CM is also able to derive estimates of the value of changes in the aggregate level of non-market goods quality. Thus, allowing the identification of the type of food desired by the consumer from a demand perspective. CM technique is a method of valuation for

assessment of the economy on goods or services that cannot be sold in the market, and is becoming more widely used in studies relating to goods or services which cannot be sold in the market.

Due to budget constraints the data collection was only carried out in the Klang Valley area from June to August 2016 by using random sampling techniques. A total of 309 respondents were gathered from both green food and non-green food consumers. Data were collected using questionnaires distributed to households in four selected areas of Klang Valley, namely the Federal Territory of Kuala Lumpur, Putrajaya, Ampang and Subang Jaya through convenient sampling technique. Self-administered questionnaires were distributed in housing areas, shopping malls, and outdoor markets.

In CM questionnaires, respondents are given a series of choice sets, where each set contains three or more resource use options. Respondents are asked to choose their preferred option from each choice set. The options in each choice set contain common attributes, which can be at various levels. The combination of attribute levels for each option in each choice set is designed using experimental design techniques. Before the choice sets are presented to the respondents, there is a description of the study site, the research issues, the proposed policy changes and its implications on attributes which are being modelled.

Data were analysed using SPSS version 21 for descriptive analyses while Choice Model utilised SAS and LIMDEP 9.0 NLogit 3.0 software for Multinomial Logit (MNL) analyses.

Model Multinomial Logit

In any form of set choices in the questionnaire, there are three indirect utility functions that can be obtained from the MNL model. Each function describes the use of resources such as the following:

- Conventional food (CON): Basic or status quo
- GMO, EMS and ORG foods: improvement of food (chicken) with environmental attributes which are better than conventional foods (no change)

General Model

$V_i = \alpha_i + \beta_i Z_i + \sigma_i X_i + \varepsilon_i$

for i = Food choices (CON, GMO, EMS, ORG)

Z_i = Green food attributes (Risk to health, Environmental impact, External features, Green food price)

X_i = Socio-economic variables (Gender, Age, Status, Household size, Educational level, Job category, Income level, Green concept)

Findings and Discussion

Profile Analysis

The profile is based on interviews of 309 respondents of the questionnaire that were identified for the purposes of this study. A total of 309 respondents were analysed by socio-demographic variables as shown in Table 1.

Table 1 shows that the composition of the female respondents of 202 people (65.4 per cent) is twice larger than the male respondents of 107 people (34.6 per cent). Most respondents consisted of couples (45.6 per cent) or heads of households (28.5 per cent) and household members represented 25.9 per cent. The average age of respondents within the age range 26 to 35 years had the highest percentage of 44.3 per cent, followed by the age range 16 to 25 years at 19.7 per cent, the age range 36 to 45 years was 16.8 per cent, 15.5 per cent in the age range 46 to 55 years and only 3.7 per cent of the elderly (> 56 years). The mean age of respondents was 34.35.

Based on the results, the study found Malay / Bumiputera is the largest ethnic composition of the study amounted to 88 per cent, followed by the Chinese (6.8 per cent) and Indian (5.2 per cent). Marital status also showed that 76.4 per cent of respondents who were interviewed are married, 21.4 per cent of respondents were found to be single and 2.3 per cent of respondents were widower / widow. In terms of the number in households, 55 per cent were found to have the number in households in the range of 4 to 6 people, 1 to 3 household is 32 per cent and 13 per cent of households are more than 7 people. The number in households' mean were 4.44.

Almost all respondents in the study had a formal education at least up to the primary level except 4 respondents who did not receive any (did not go to school). The results showed that most respondents had education up to certificate or diploma level (28.8 per cent), followed by 23.9 per cent and 23.6 per cent of respondents up to lower secondary education and higher secondary education respectively. The respondents who furthered their studies to bachelor's degree level was 18.4 per cent, 2.6 per cent at the Masters or PhD level and only 1.3 per cent of respondents at the primary level.

Table 1: Respondents' Socio-demographics

Demographic Profile	**n (%)**	**Mean**	**Standard Deviation**
Gender		-	-
Male	107 (34.6)		
Female	202 (65.4)		
Respondents position		-	0.74
Head of household	88 (28.5)		
Spouse	141 (45.6)		
Household member	80 (25.9)		
Age (Year)		34.35	10.17
16-25	61 (19.7)		
26-35	137 (44.3)		
36-45	52 (16.8)		
46-55	48 (15.5)		
> 55	24 (3.7)		

Ethnic		-	0.54
Malay/Bumiputera	272 (88.0)		
Chinese	21 (6.8)		
Indian	16 (5.2)		
Marital Status		-	0.49
Married	236 (76.4)		
Single	66 (21.4)		
Others	7 (2.3)		
Number in Household		4.44	1.89
1-3	99 (32.0)		
4-6	170 (55.0)		
7-9	35 (11.3)		
≥10	5 (1.7)		
Educational Level		-	1.22
Never attended school	4 (1.3)		
Primary	4 (1.3)		
Lower Secondary	74 (23.9)		
Higher Secondary	73 (23.6)		
Certificate or Diploma	89 (28.8)		
Bachelor	57 (18.4)		
Master or PhD	8 (2.6)		

Table 2 shows that as many as 42.7 per cent of respondents work in the private sector, followed by 23.3 per cent in the government sector, 23 per cent of respondents are housewives, 9.1 per cent are businessmen / self-employed and 1.9 per cent are pensioners. This indicates that about 66 per cent of the total respondents work in the private sector and the public sector. The mean value of 26.2 found that most of the respondents who work in the private sector and the public sector are in technical and services category (31.2 per cent) as well as management and professional group (29.8 per cent) which amount to 61 per cent, followed by support staff at 22.4 per cent and the last group, general workers, at 16.6 per cent.

The mean of the monthly household income of RM3,948.48 shows that almost half of respondents (51.2 per cent) have a monthly income of RM3,001 to RM5,000, followed by 35.9 per cent with a monthly income of RM3,000 and below, and 7.1 per cent with a monthly income between RM5,001 and RM7,000. Only 2.9 per cent had a monthly income between RM7,001 to RM9,000 and another 2.9 per cent had a monthly income above RM9,000.

Table 2: Employment and Respondents' Income

Demographic Profile	n (%)	Mean	Standard Deviation
Working Status		-	1.13
Government	72 (23.3)		
Private	132 (42.7)		
Businessman	28 (9.1)		
Housewife	71 (23.0)		
Pensioner	6 (1.9)		
Job Category*		-	1.06
Management & Professional	61 (29.8)		
Technical & Service	64 (31.2)		
Support Staff	46 (22.4)		
General Worker	33 (16.6)		
Household Income		3948.48	1777.22
≤ RM3000	111 (35.9)		
RM3001-RM5000	158 (51.2)		
RM5001-RM7000	22 (7.1)		
RM7001-RM9000	9 (2.9)		
> RM9000	9 (2.9)		

* Working status of respondents, namely government and private employees only (n=204)

Table 3 shows that 39.2 per cent knew of the existence of the concept of green food while 60.8 per cent did not know the existence of this concept. These results reflect the level of public knowledge of the concept of sustainable food is still low. However, the main sources for the respondents who were aware of the concept of green food were through main electronic media (internet and television) and mass media (newspapers).

Table 3: Response of Respondents to the Concept of Green Food

Item	n (%)	Mean	Standard Deviation
Know the concept of green food		-	0.49
Yes	121 (39.2)		
No	188 (60.8)		

Table 4 shows the percentage of respondents who choose the types of food (conventional, GMO, EMS and organic) from a set of choices (Chicken) described in this study. The results show that, EMS food was the option with the highest percentage of respondents (38.4 per cent) compared with the GMO food (25.0 per cent), conventional food (20.3 per cent) and organic food (16.3 per cent). It also shows that Malaysian consumers preferred green foods (79.7 per cent) rather than conventional foods (20.3 per cent) in their food consumption.

Table 4: Respondents' Choices on Types of Food

Respondents' Choices	**(%)**
Chicken	
Conventional	20.3
GMO	25.0
EMS	38.4
Organic	16.3
Total	**100.0**

An Estimation Results of Chicken Choice Sets

Results of the estimation model set options (chicken) is shown in Table 5. The coefficient of attributes (risk to human health, the environmental impact of the production of chickens, external characteristics and price) have the expected signs. However, only three attributes (risk to human health, environmental impact and price), each found to be significant at the significance level of 1 per cent, 10 per cent and 5 per cent, while the external characteristics were found to be significant for model estimation of chicken choice sets.

The risk to human health (risk), was found to be significant at 1 per cent significance level and had the expected sign of which is negative. This suggests that the increase in the risk to human health will produce negative utility (V^{CON}, V^{GMO}, V^{EMS} and V^{ORG}). For example, increasing the risk to human health by as much as 1 per cent would reduce the utility of human health choices for all types of poultry by an average of 0.245 per cent [$(e^{-0.2809}-1)$], assuming all other variables remain unchanged.

Next, the impact on the environment from the production of chicken (Environment) was also found to be significant at the 5 per cent significance level and had a sign that is negative as expected. It is clear that increasing the impact on the environment of the production will generate negative utility (V^{CON}, V^{GMO}, V^{EMS} and V^{ORG}). For example, the reduction of environmental impact (Environment) of 1 per cent would increase the utility environment of all kinds of chicken choice by an average of 0.147 per cent [$(e^{-0.1374}-1)$], assuming other variables remain unchanged.

Next, the chicken price (Price) is also found to be significant at the 5 per cent significance level and has a sign that is negative as expected. This explains that the increase in the price of chicken will produce negative utility (V^{CON}, V^{GMO}, V^{EMS} and V^{ORG}). For example, an increase in chicken prices by 1 per cent will increase the utility

of all the choices of chicken by an average of 0.078 per cent [($e^{-0.0810}$-1)], assuming all other variables remain unchanged.

However, the results of the estimation model of chicken choice set found the attribute external features to be not significant at the significance level of 10 per cent for all kinds of choice of chicken (V^{CON}, V^{GMO}, V^{EMS} and V^{ORG}). It is clear that changes to these attributes (Feature) do not affect the utility as a whole.

The study also shows that some of the socio-economic variables (Gender, Age, Status of Respondents [Status], household size [Household], the level of education [Education], the status of the job [Work], income [Income] and the concept of green food [Concept]), have been found to affect change utility in chicken feed choice set to feature a choice of CON, GMO and EMS. While the organic food (ORG) as a control to choice set in this estimation model. First, the Gender (1-men and 0-women) variable is found significant at the significance level of 1 per cent and positively associated with the choice of conventional food (CON). Green Food choice are Genetically Modified Organism (GMO) and Environmental Management System (EMS) are found significant at the significance level of 5 per cent. These results indicate that changes in men rather than women, by 1 per cent would increase CON food by an average of 0.771 per cent [($e^{0.5713}$-1)], 0.385 per cent [($e^{0.3257}$-1)] for food characterized by GMO and 0.564 per cent [($e^{0.4473}$-1)] also for the food choice is characterized by EMS, assuming other variables remain unchanged.

Second, the age variable (age ≤ 40 = 1 and age> 40 = 0) is negatively related to the food choice characterized by conventional (CON), genetically modified (GMO) and environmental management system (EMS) that is significant at 5 per cent level of the significance, while the food characterized under Genetically Modified Organism (GMO) is significant at the 1 per cent level of significance. This decision means that respondents' age less than or equal to 40 years compared with respondents aged over 40 years has changed as much as 1 per cent would reduce the utility of the CON food choices characterized by an average of -0.405 per cent [($e^{-0.5208}$-1)], characterized -0.551 per cent for GMO [($e^{-0.8012}$-1)] food and 0.470 per cent [($e^{-0.6355}$-1)] also for EMS food, assuming all other variables in the model of chicken set option were unchanged.

Third, the respondent status variable (1-Head of household / spouse and 0-household members) showed a negative relationship with food choices characterized by conventional (CON) is significant at 1 per cent significance level. Meanwhile, the choice of food is characterized by genetically modified (GMO) and environmental management system (EMS) is also negatively correlated but significant at the significance level of 5 per cent. It is clear that changes in the status of the respondents as the head of household / spouse compared against household members change by 1 per cent would reduce the utility of food choices CON characterized by an average of -0482 per cent [($e^{-0.6584}$-1)], 0.427 per cent for food characterized GMO [($e^{-0.5572}$-1)] and 0.331 per cent [($e^{-0.4024}$-1)] for food characterized by EMS assuming other variables remain unchanged.

Fourth, the size of the household (Household) variable showed a positive relationship with food choices characterized by conventional (CON), genetically modified (GMO) and environmental management system (EMS), which are all significant at the 1 per cent level of significance. This decision means that, the number

of households with at least five people living together compared to the number of households with more than five people living together were unchanged at 1 per cent would increase the utility of dining options feature CON, GMO and EMS, which are 0.570 per cent [($e^{0.4508}$-1)], 1.05 per cent [($e^{0.7173}$-1)] and 0.748 per cent [($e^{0.5586}$-1)] respectively, assuming all other variables remain unchanged.

Fifth, the education variable (Education) shows negative relationship with the food choice is characterized by conventional (CON) and genetically modified (GMO) were significant at the significance level of 5 per cent, while the choice of food is characterized by the management of environmental systems (EMS) did not show significant results. It is clear that the education level of respondents who have a diploma, degree, masters and PhD compared to respondents with low education / secondary change by 1 per cent would reduce the utility of CON food choices characterized by an average of 1.46 per cent [($e^{-0.3927}$-1)] and 0.66 per cent [($e^{-0.4529}$-1)] for food characterized by GMO, assuming all other variables remain unchanged.

Sixth, job category (1-private staff and 0-other staff), was found to correlate positively and significantly at 1 per cent significance level with CON and GMO food choices, while for the EMS food choices it was also significant at the 5 per cent significance level. This decision means that any changes in the private staff of 1 per cent would increase the utility of food for an average of 1.07 per cent of CON [($e^{0.7301}$-1)], GMO as much as 0.724 per cent [($e^{0.5452}$-1) and EMS of 0.564 per cent [($e^{0.4251}$-1), assuming all other variables remain unchanged.

Seventh, the level of income, available food choices has negatively related to the concept, which GMO and EMS are not significant at the 10 per cent significance level. This decision means that any change in income of 1 per cent does not change utility options for all three types of preferred foods. The income level of the respondents of RM5,000 and below does not change the respondents utility in their choice making.

The last variable is the respondents' knowledge about green food concept (Concept). Results showed that under the estimation model, the variables significant with the concept of GMO, CON and EMS food choices were at the significance level of 1 per cent and 5 per cent respectively. The three choices are negatively correlated. These results show that increasing the level of knowledge on the concept of sustainable food will reduce utility of GMO, CON and EMS food choices by an average of -0.401 per cent [($e^{-0.3184}$-1)], -0.364 per cent and -0.244 per cent, assuming other variables remain unchanged.

Table 5: Results of MNL Model Estimates for Chicken Choice Sets

V^{CON} = - 0.2809Risk +0.1374Environment - 0.1084Feature - 0.0810Price + 0.2566 + 0.5713Gender
(0.0731)* (0.0766)*** (0.0875) (0.0340)** (0.4701) (0.1557)*
- 0.5208Age -0.6584Status + 0.4508Household - 0.3927Education + 0.7301Job
(0.2067)** (0.1851)* (0.1731)* (0.1580)** (0.1525)*
- 0.0955Income - 0.4520Concept
(0.2292) (0.1479)**

V^{GMO} = - 0.2809Risk +0.1374Environment - 0.1084 Feature - 0.0810 Price + 0.0728 + 0.3257 Gender
(0.0731)* (0.0766)*** (0.0875) (0.0340)** (0.4779) (0.1491)**
- 0.8012Age - 0.5572Status + 0.7173Household - 0.4529Education + 0.5452Job
(0.1938)* (0.1818)** (0.1700)* (0.1517)** (0.1546)*
- 0.2245Income - 0.5130Concept
(0.2347) (0.1421)*

V^{EMS} = - 0.2809Risk +0.1374Environment - 0.1084Feature - 0.0810Price + 0.7645 + 0.4473 Gender
(0.0731)* (0.0766)*** (0.0875) (0.0340)** (0.3651)** (0.1383)**
- 0.6355Age -0.4024Status + 0.5586Household - 0.0689Education + 0.4251Job
(0.1828)** (0.1674)** (0.1530)* (0.1405) (0.1957)**
- 0.3009Income - 0.2801Concept
(0.1957) (0.1298)**

V^{ORG} = - 0.2809Risk + 0.1374 Environment - 0.1084Feature - 0.0810Price
(0.0731)* (0.0766)*** (0.0875) (0.0340)**

R^2 =0.0237 $\bar{R}^2$=0.0190 log-likelihood= -2846.856 AIC =2.6318 $\chi^2[25]$ = 137.952*

Note : *,**,*** Significant at the significance level of 1%, 5% and 10%. Values in parentheses are standard deviations.

Marginal willingness to pay

Marginal willingness to pay (MWTP) explains the marginal rate of substitution between non-monetary attributes (Risk, Environmental Impact and External features) with monetary attributes (Price) for an increase of the non-monetary unit, also known as the implicit price. MWTP method is estimated by dividing the coefficient of non-monetary attributes and monetary attribute. MWTP estimation results for each non-monetary attributes are shown in Table 6.

With reference to the choice set model of chicken showed that on average the respondents are willing to pay RM3.460 for reducing the risk to human health (use of chemicals) and the respondents' willingness to accept compensation of RM1.723 against the impact on the environment of the production process (examples of odour pollution) if the effect is increased. For the external characteristics, the respondents were willing to pay a total of RM1.338 for improvements to these attributes. Therefore, the results of the study (chicken set model) shows that it is better for the respondents to make a choice that takes precedence when they are clear and understand the specifications given.

Table 6: Marginal Willingness to pay (MYR per unit)

Attributes	Implicit Price
Risk	3.46
Environmental Impact	[1.723]
External Features	1.338[NS]

[NS] coefficient is not significant and [] indicate the implicit price is negative.

Conclusion

These results reflect that the level of knowledge regarding the green food concept is still low, where only 39.2 per cent knew of the existence of this concept as compared to 60.8 per cent who do not know this concept.

The results show that, EMS food choice are the highest percentage (38.4 per cent) compared with the GMO food choice (25.0 per cent), conventional food (20.3 per cent) and organic food (16.3 per cent). Meanwhile, the estimation shows that some socio-economic variables (gender, ethnicity, education, marriage, employment, income and concept), can affect utility changes in conventional, GMO and EMS food choice sets.

The results of the WTP estimation have suggested that on average households are willing to pay RM3.460 for a reduction in the risk to human health (such as the use of chemicals) and the respondents' willingness to accept compensation of RM1.723 against the impact on the environment during the production process (for example odour pollution) if the effect is increased. For the external features the respondents were willing to pay a total of RM1.338 for an improvement to these attributes. Therefore, the results show that it is better for the respondents to make their choice that refer to when they are clear and understood. The specification describes that an average household would be very concerned about the risk factors to human health and the impact on the environment from sustainable food choices in the practice of a healthy lifestyle. While the external features are not significant and does not affect households in green food choices. Therefore, the food manufacturers and the government should take the initiative to apply these factors in sustainable food production so that a healthy lifestyle can continue to be practised.

Finally, any results of this study can be used by any party, especially consumers, food producers, and the government for improvement and to identify the factors which influence consumers in making green food purchasing decisions. This is important because it can indirectly help increase the number of consumers who consume green food in their daily life. Lastly, it will not only help improve the country's economy but can also improve the quality of public health and better protect the environment.

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