Are Thai Consumers Willing to Pay for Food Safety Labels? Choice Experiment on Fresh Produce

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Abstract
Thai government introduced a food safety label (Q mark) to help consumers recognizing produce with higher level of safety assurance. Producers and retailers are sceptical on whether Thai consumers place value on it, thus they are reluctant to apply to obtain certification and label. This study aims to estimate the value Thai consumers place on food safety labels for fresh produce using a discrete choice experiment approach and a mixed logit (RPL) model. A sample of 350 Thai consumers was surveyed in Bangkok in 2013. Thai consumers are willing-to-pay a premium price for food safety labelled produce over unlabelled ones.

Keywords: food safety label, stated choice experiment, mixed logit, fresh produce, Thailand

1. Introduction

Thai consumers' concerns on food safety has been increasing during last decades, especially in urban area (e.g., Bangkok and Chiangmai) (Posri, Shankar and Chadbunchachai, 2006; Takeuchi and Boonprab, 2006; Roitner-Schobesberger *et al.*, 2008; Lippe, Mergenthaler and Isvilanonda, 2010). Johnson et al. (2008) also mentioned that demand for horticultural fresh produce in Thailand will become more differentiated in terms of safety, quality and convenience, suggesting that safety and quality attributes will become more important in Thai fruit and vegetables industry development. This is due to the fact that food safety scandals still remain a prominent issue in domestic markets, for instance scandals related to chemical residues on some fresh produce (e.g., Chinese Kale and chilli), or the outbreak of *Clostridium botulinum* contamination in home-canned bamboos shoots. In order to meet consumer demand and to increase the level of food safety assurance provided by the market, the Thai government tried to strengthen the regulation in the domestic market and to introduce a voluntary standard for enhanced food safety assurance procedures and the related food safety label in the market. In 2004, the government enacted a food safety policy named “From-Farm-To-Table” or “From-Farm-To-Forks” aimed at ensuring food safety monitoring and control system throughout the food chain [The National Bureau of Agricultural Commodities and Food Standard (ACFS, 2011)]. Subsequently, in 2005, ACFS established a voluntary food safety label named "Q mark[1]" as an attempt to reach improved food safety goals, to encourage competition in food product markets, and to provide information to assist consumers in recognising safe-products, particularly fresh produce that is the main concern of Thai consumers (Vanit-Anunchai and Schmidt, 2006; Lippe, 2010). After Q mark other labels linked to improved food safety standards have been introduced in the Thai market. Currently, Q mark is the dominant food safety label for fresh produce in the Thai market. Q mark products, however, have been distributed mainly through supermarket chains, while most of Thai consumers still buy fresh produce at fresh markets (wet markets). So, a majority of consumers are not aware of or do not understand the meaning of this label. Hence, the fresh produce industry (particularly retailers at fresh markets) and producers hesitate to comply with regulations to obtain this certification and label, because they are uncertain on whether they will obtain a price premium to compensate the investment needed to comply with the

[1] According to TACFS 9005-2548 (2005), section 4, in order to use Q mark, the primary production processes at farm level has to be in accordance with the requirements of national GAP standards and be certified by the CB; the production process and post-harvest activities (e.g., pack house facilities) has to conform to GMP or HACCP and must be certified by the CB; the operators must observe procedures for tracing products and complying with traceability requirement; and products using Q mark will be tested for quality and safety.

standards. This contributes to hinder the development of a market for safer fresh produce. It could also be a key constraint for the Thai government in its effort to present Thailand as "Thai Cuisine to the World[2]" and for the industry to compete with neighbouring countries after the entry in the ASEAN Economic Community in 2015.

In order to address the market and policy concerns related to food safety labelling policies, policy makers need additional information on Thai consumer preferences to understand the relative value of a food safety label, compared to existing brands, as well as to other important fresh produce quality attributes. Thus, assessing social desirability for a food safety label could aid policy makers in drafting and implementing more effective food safety policies and restoring consumer confidence. Furthermore, the study on consumers' preferences and willingness-to-pay (WTP) for different attributes of fresh produce is important for stakeholders (i.e. producers and firms) to be taken into account when they make a decision on production or marketing activities.

Numerous studies have examined consumers' preference and WTP for labelling programs associated with food safety attributes (e.g., Alfnes, 2004; Angulo and Gil, 2007; Loureiro and Umberger, 2007; Tonsor et al., 2009). Relatively little consumer research exists assessing Thai consumers preferences for food safety labelling[3]. Currently no known published research exists which compares Thai consumers' relative value of food safety label, brand and several relevant fresh produce attributes. This research aims to fill the gap by providing insight on Thai consumers preference.

The objectives of this study are two folds: (1) determine the value Thai consumers place on a well-known food safety label and relevant attributes of fresh produce; and (2) assess the effect of consumer characteristics and consumption behaviour toward WTP for fresh produce with food safety label. The ultimate purpose is to provide policy makers with useful information on food safety label policy and to guide future management and marketing strategies for the Thai fresh produce industry.

2. Methods and data

Although several techniques could be employed to measure WTP, we chose to use a discrete choice experiment because it is the most flexible technique to analyse the value of food attributes (e.g., Burton et al., 2001; Alfnes, 2004; Loureiro and Umberger, 2007), particularly in situations where market data are non-existent or unreliable (Tonsor et al., 2009). The advantage of choice experiment is that it allows the researchers to combine different product attributes that may or may not already exist in the market and force respondents to trade off one attribute against another (James and Burton, 2003). Nevertheless, a main concern when using this technique is the potential presence of hypothetical bias (Neill et al., 1994; Lusk and Hudson, 2004; Alfnes et al., 2006), a problem that is common to all the stated preferences WTP elicitation techniques. This problem could be limited by using cheap talk[4] before the experiment (Silva et al., 2011).

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[2] The Thai government's policy to promote Thailand to be the Kitchen of the World. It aims to promote the Thai food to be one of the favourite food recipes all over the world, including export of raw materials and additional ingredients for Thai recipes with the highest creditability in safety, health and sanitation (http://www.thaifoodtoworld.com)

[3] Lippe (2010) evaluated the preferences and WTP of consumers in Thai urban areas (Bangkok and Chiangmai) for pesticide-safe cabbage using contingent valuation and choice experiment. The results from contingent valuation method was that the mean WTP was 47.3 baht per kilogram. The results from choice experiment estimated by mixed logit model was that consumers would be willing to pay 12 baht per kilogram more for safe cabbage than the conventional product, and 7.09 baht per kilogram more for the certificate. However, the study did not specify the certification scheme (i.e. certificate attribute including certificate, non-certificate).

[4] Script explains the problem of hypothetical bias to participants prior to administration of a hypothetical question. The premise behind this technique is that one might be able to reduce or eliminate hypothetical bias by simply making respondents aware of it regardless of its underlying cause.

The attributes freshness, price, and brand & label were selected based on the results of previous consumer research studies regarding the attributes preferred by consumers and their WTP for these attributes (Shepherd, 2006; Gorton, Sauer and Supatpongkul, 2009; Lippe and Isvilanonda, 2010; Moser, Raffaellib and Thilmany-McFadden., 2011). Chinese cabbage was chosen as a representative product because it is a common fresh vegetable that Thais consume both raw and cooked on a regular basis; besides, it is the vegetable that Thai consumers are moderately concern about because of residues of chemicals, therefore, they might look for the guarantee of food safety before making a decision. Q mark is the main food safety label of interest, while other common signals of food safety available on the Thai market, such as the claimed[5] "Safe Produce (ผักปลอดสารพิษ)" and private brands (i.e. Royal Project "โครงการหลวง" and Doctor's Vegetables "ผักด็อกเตอร์") are included in this study to ensure it is realistic in consumer's eyes.

The data used in this study are drawn from a survey administered to a sample of Thai consumers during July 2013 in Bangkok and Nonthaburi, Thailand. Quota sampling according to the shopping outlets and convenience sampling methods were adopted to reach the target number of respondents (350). Two hundred persons were recruited at the fresh markets and the rest were recruited at supermarkets because Thai consumers still buy fresh vegetables mainly from fresh markets (Gorton, Sauer and Supatpongkul, 2011). The questionnaire was administered face-to-face by trained interviewers in two fresh markets ("Yingchareon Market" and "ATK") and three supermarkets ("The Mall, Ngamwongwan", "TOPs market, Kaset" and "Tesco Lotus, Bangsue") on the weekdays and weekends and at different times of the day to cover a wide range of consumer types. Interviewers stayed nearby the fresh fruits and vegetables shelves and asked consumers to participate the survey on a voluntary basis. Before the interview starts, interviewers asked three screening questions related to being at least 18 years old; being the main household food shoppers; and consuming vegetables and cabbages. The interviews were conducted in Thai language and its duration ranged between 10-15 minutes.

Questionnaire was structured in 4 parts: (1) dietary habits and consumption patterns; (2) choice experiment; (3) knowledge and attitudes of food safety and food safety label; and (4) respondent and household characteristics. The questions take closed-form and multiple choices. In the attitude section, respondents were asked to give their opinion toward statements according to a 5-point Likert-like scale, ranging from 1 (Strongly disagree) to 5 (Strongly agree). For choice experiment part, respondents were presented with a set of 12 simulated choice shopping tasks and they were asked to choose a preferred alternative between two profiles of Chinese cabbages and a "no purchase" option.

Table 1 shows the attributes and attribute levels evaluated in the choice experiments. As mentioned earlier, we considered 4 types of ways to signal a "safer" food product : "Q mark", which is the main food safety label in the market; label claiming "Safe Produce" ("ผักปลอดสารพิษ") which is not supported by any quality assurance system, but is widespread throughout the market; and two private brands "Royal Project" and "Doctor's Vegetables", which are among the most well-known fresh produce brands in the market and are considered as high quality and safety brands. Since most of the products from these private brands obtained Q mark, in order to make the simulated shopping situation realistic, in this experiment Q mark always appeared together with the private brands.

[5] It is only a "claim" that the product is safe without the guarantee or inspection from government authorities or third parties.

An efficient or D-optimal design[6] was applied to design choice experiment using the software Ngene 1.1.1 (Choice Metrics, 2012). The main effect was employed to select choice situations (Lusk and Norwood, 2005; Olynk, Tonsor and Wolf, 2010). The final design comprised of 12 choice situations with 2 unlabelled cabbage alternatives and "opt-out" or no purchase option was chosen as the one, which among evaluated designs (iterations) had the lowest D-error (0.2090).

Table 1. Attributes and levels of fresh Chinese cabbages used in the choice experiment.

Product attribute	Attribute label
Price	25 baht/kg
	50 baht/kg (Average market price)
	75 baht/kg
	100 baht/kg
Freshness (day after harvest)	0 day (Today) (status quo)
	1 day (Yesterday)
	2 days (2 days before)
Brand and Label	No information (status quo)
	Claimed "Safe Produce"
	Q mark (Q-GAP)
	Royal Project and Q mark
	Doctor's Vegetables and Q mark

In July 2013, 1 US Dollar = 31.13 Thai baht (BHT).

Prior to the choice experimental part, respondents were informed that the cabbage products presented to them differ only in terms of the three attributes described, and that all other attributes are identical. They were also informed about the meaning of each considered attributes. The choice situations were presented by using pictures and clear labelling to aid respondents' understanding (Figure 1). The choice questions were presented in randomized order across respondents to avoid any ordering biases (Loureiro and Umberger, 2007). We included also a “Cheap Talk” script to be presented to the respondents right before the choice question, reminding consumers about their budget constraint and ask them to choose the alternative as if they were choosing products in the real situation.

3. Empirical model and statistical analysis

Descriptive statistics analysis was used to describe Thai consumers' features in terms of socio-demographics and consumption habits. Mann-Whitney U tests (Mann and Whitney, 1947) were used to compare features between consumer groups (fresh market and supermarket). The choice experiment data were analysed using a random utility framework (Marschak, 1960; McFadden, 1974). The mixed logit or random parameters model (RPL) was applied to analysed data using the package mlogit (Croissant, 2012) available in the statistical software R2.14.2 (R Core Team, 2013).

Explanatory variables included in the model were divided into four groups: product attribute main effect variables; socio-demographic variables; consumption behaviour variables; and interaction terms. Main effect variables include price and alterative specific attributes (freshness and brand & label). Socio-demographic variables comprise gender, having at least one child aged 8 years old or younger and having at least one child aged 9-15 years old. Consumption behaviour variables comprise shopping outlet (fresh market/supermarket) and frequency of buying fresh produce. The interaction terms are brand

[6] The design that allows parameters to be estimated with as low as possible of asymptotic standard errors of the parameter estimates (i.e. the square roots of the diagonal elements of the asymptotic variance-covariance) (Jaeger and Rose 2008).

& label variables interacted with shopping location. All variables except price are coded using effects coding (Bech and Gyrd-Hansen, 2005).

Which of the following three choices do you prefer for each choice set?

Option A	**Option B**	**Option C**
 Freshness = today Claimed “Safe Fresh Produce” ("ผักปลอดสารพิษ") 25 baht/kg	 Freshness = yesterday 75 baht/kg	Neither A or B
I choose ...		

Figure 1. Example of a choice set included in the choice experiment.

The behavioural model for main effect variables plus socio-demographic variables, consumption behaviours, and interaction terms is specified as follows:

$$
\begin{aligned}
V_{ijt} = \alpha_{A,B} &+ \beta_1 Price_{ijt} + \beta_2 Freshness1_{ijt} + \beta_3 Freshness2_{ijt} \\
&+ \beta_4 BRL1_{ijt} + \beta_5 BRL2_{ijt} + \beta_6 BRL3_{ijt} + \beta_7 BRL4_{ijt} \\
&+ \beta_8 Female_i + \beta_9 Child8_i + \beta_{10} Child15_i \\
&+ \beta_{11} FreshMarket_i + \beta_{12} Freq2_i + \beta_{13} Freq3_i + \beta_{14} Freq4_{i+} \beta_{15} Freq5_i \\
&+ \beta_{16} BRL1_{ijt}{*}FreshMarket_i + \beta_{17} BRL2_{ijt}{*}FreshMarket_i \\
&+ \beta_{18} BRL3_{ijt}{*}FreshMarket_i + \beta_{19} BRL4_{ijt}{*}FreshMarket_i + \varepsilon_i \qquad (1)
\end{aligned}
$$

where i = 1, ..., N is the number of the respondents, t is number of choice occasion, j is option A, B, C (no buy option); V_{ijt} is the individual representative utility for each respondent, alternatives, and choice set; $\alpha_{A,B}$ is an alternative specific constant of option A and B, $Price_{ijt}$ is the price for 1 kg of Chinese cabbage of alternative j; $Freshness1_{ijt}$ (freshness = yesterday), $Freshness2_{ijt}$ (freshness = 2 days ago), $BRL1_{ijt}$ (Claimed "Safe Produce"), $BRL2_{ijt}$ (Q mark), $BRL3_{ijt}$ (Royal Project & Q mark), and $BRL4_{ijt}$ (Doctor's Vegetables & Q mark) are attributes of alternative j; $Female_i$, $Child8_i$ (having at least one child ages≤ 8 years old), and $Child15_i$ (having at least one child ages 9-15 years old) are socio-demographic variables; $FreshMarket_i$ (shopping at Fresh market) and $Freq_i$ (frequency of buying fresh produce, $Freq2_i$ = 2-3 times/month, $Freq3_i$ = once/week, $Freq4_i$ = 2-3 times/week, $Freq5_i$ = 4 or more times/month) are consumption behaviours of respondents i; and BRL_{ijt}* $FreshMarket_i$ (interaction terms) are brand & label variables interacted with shopping location; and ε_i is error term.

All of the main effects parameters except price (freshness and brand & label) were modelled as random parameters and were assumed to be distributed normally. Others were modelled as fixed parameters.The RPL models were run using 100 Halton draws and taking

into account the panel data structure. Average willingness-to-pay (WTP) for each attribute levels of brand & label attribute was calculated as follows:

$$WTP(Label_i) = -(\beta_i - \beta_{no\ info})/\beta_1 \quad (2)$$

The parameter on price (β_1) approximates mean marginal utility of income and the parameters on each brand & label (β_4, β_5, β_6 and β_7) indicate the marginal (dis)utility change from no information (no label & brand) to Claimed "Safe Produce", Q mark, Royal Project & Q mark, and Doctor's Vegetables & Q mark, respectively.

4. Results

4.1 Consumers' socio-demographic characteristics and consumption habits

The selected demographic attributes are provided in Table 2.

Table 2. Socio-demographic characteristics and consumption behaviour of the sample.

Characteristics	Percent of total (%)		
	Fresh market (N = 200)	Supermarket (N = 150)	Pooled sample (N = 350)
Gender			
Female	87.00%	85.30%	86.30%
Male	13.00%	14.70%	13.70%
Age (Mean , St.dev.)	44.91 (14.530)	40.39 (15.421)	42.96 (15.067)
19-30 years	21.20%	32.00%	25.90%
31-40 years	16.70%	20.70%	18.40%
41-50 years	22.70%	18.70%	21.00%
51-60 years	24.20%	18.00%	21.60%
More than 60 years	15.20%	10.60%	13.10%
Educational level (Median)	4	4	4
1 = Less than middle school	18.00%	7.30%	13.40%
2 = Middle school	7.50%	3.30%	5.70%
3 = High school or equal	18.50%	18.00%	18.30%
4 = University degree	51.50%	68.00%	58.60%
5 = High Vocational Certificate	4.50%	3.40%	4.00%
Average household income (Median)	3	4	4
1 = Less than 10,000 baht/month	7.00%	4.00%	5.70%
2 = 10,000 - 24,999 baht/month	20.50%	22.70%	21.40%
3 = 25,000 - 39,999 baht/month	25.00%	14.70%	20.60%
4 = 40,000 - 54,999 baht/month	15.50%	16.00%	15.70%
5 = 55,000-69,999 baht/month	10.00%	12.00%	10.90%
6 = 70,000 baht/month or more	22.00%	30.60%	25.70%
Having children < 8 years living with you	24.00%	16.70%	20.90%
Having children 9-15 years living with you	25.50%	20.70%	23.40%
Frequency of buying fresh produce (Median)	4	4	4
1 = Once per month or less	2.50%	4.70%	3.40%
2 = 2-3 times per month	7.50%	10.00%	8.50%
3 = Once per week	18.50%	24.00%	20.90%
4 = 2-3 times per week	35.50%	42.70%	38.60%
5 = 4 or more times per week	36.00%	18.60%	28.60%
Have ever bought Q mark products	62.00%	60.70%	61.40%
Have ever bought Royal Project brand products	77.50%	80%	78.60%

The majority of respondents were female (86%), as expected when targeting responsible of food shopping for Thai household. Average respondent is 43 years old. The majority of respondents have University Degree (58%). Average household income was between 40,000 to 54,999 baht/month. However, income levels of respondents are quite diversified. More than 25% of respondents are categorised in the upper income level. Around 21% of respondents had children aged less than 8 years old at home and 23% of respondents had children between 9-15 years old at home. Comparing between respondents at fresh market and supermarket using Mann-Whitney U test, respondents at the fresh markets have significantly higher average age range, lower average education level (high school) and higher frequency of purchasing (4 or more times per week). We found that the respondents' characteristics are consistent with Bangkok census data in 2011 on average age (30-40 years old), average household income (48,951 baht/ month) and average highest level of education (high school). The higher proportion of higher education respondents in the sample might due to the fact that TOP supermarket (Kaset) is located nearby a University and several Government Offices. The high proportion of elder respondents might be because the elders had more time and tend to cooperate more in surveys, whilst the high numbers of respondents with an upper income level may be due to the fact that ATK is a high-end market. Regarding fresh produce consumption habits, more than 67% of respondents purchased fresh produce at least 2-3 times per week. In addition, more than half of respondents had ever bought products with Q mark (61%) and Royal Project brand (79%) from time to time.

4.2 Estimation results

The parameter estimates of the RPL models for main effect variables, socio-demographic variables, consumption habits and the interaction terms are listed in Table 3. Only 344 respondents completed questions regarding socio-demographics and consumption habits. The null hypothesis that all coefficients are zero is rejected by a likelihood ratio test (p-value < 0.01). This implies that attributes chosen in this research (freshness, price, and brand & label) are all considered as relevant attributes by consumers. The constants for the purchase of cabbage (options A and B) are positive and significant, meaning that consumers are willing to pay a price to purchase the product.

As expected, the coefficient for the price is negative. The highest utility increment occurs due to freshness, followed by the presence of brand & food safety labelling. Regarding freshness attribute, cabbage that was harvested 2 days ago is significantly less preferred by consumers, while produce harvested today and yesterday are more similar in preference. With respect to brand & label attribute, the coefficients of "Q mark", "Royal Project & Q mark", "Doctor's Vegetables & Q mark" and Claimed "Safe Produce" are significantly positive, suggesting that the utility for Chinese cabbage with these brands & labels will be higher than for the one without a label. Nevertheless, all coefficients of parameters in brand & label attribute (except claimed label) are not significantly different among them, perhaps implying that consumers do prefer to have a brand or label over nothing and over claimed label, but they do not care about which label is presented. It should be noted that surveyed consumers were informed about the meaning of claimed in advance; hence, this information may affect consumers' decision as well.

The estimated standard deviation parameters for all brand & label attributes except Claimed "Safe Produce" label are significantly different from zero, suggesting that there is heterogeneity in the population in terms of respondents' preferences for brand & label, particularly for Royal Project and Doctor's Vegetables. In addition, Royal Project & Q mark attribute has the highest standard deviation, which is higher than the estimated parameter; this means that there is high heterogeneity among surveyed consumers for this brand & label. Put

in other words, for some consumers the brand Royal Project in addition to Q mark might add value to the product; whilst for others the brand might have negative effect. However with this design we cannot distinguish the effect of the brands from the label.

Table 3. Estimated parameters for RPL with main effects, the interaction terms, socio-demographics, and consumption habits.

Coefficients	Estimates	Coefficients	Estimates
Intercept (option A)	3.4169***	Shopping location	
Intercept (option B)	3.2465***	*Fresh market*	-0.2663***
Price	-0.0262***	*Supermarket*[a]	0.2663***
Freshness		Purchasing Frequency	
Today[a]	0.9185***	*Once per month*[a]	-0.4685
Yesterday	0.2028***	*2-3 times per month*	0.3600
2 days ago	-1.1213***	*Once per week*	0.1482
Brand & Label		*2-3 times per week*	-0.2389**
No information[a]	-1.7055***	*4 times or more per week*	0.1992
Claimed "Safe Produce"	-0.1675**	St.dev.	
Q mark	0.5989***	Freshness	
Royal Project & Q	0.6161***	*Yesterday*	0.3343***
Doctor's Vegetables & Q	0.6580***	*2 days ago*	0.7159***
Location Interactions with Brand & Label		Brand & Label	
*Claimed * Fresh market*	0.1481**	*Claimed "Safe Produce"*	-0.0635
*Q mark * Fresh market*	-0.1362**	*Q mark*	0.4067**
*Royal Project * Fresh market*	-0.0714	*Royal Project & Q*	1.0200***
*Doctor's Vegetables * Fresh market*	0.0052	*Doctor's Vegetables & Q*	0.5861***
*Claimed * Supermarket*[a]	-0.1481**	Number of respondents	344
*Q mark * Supermarket*[a]	0.1362**	Number of observations	4128
*Royal Project * Supermarket*[a]	0.0714	Log likelihood	-2852.2
*Doctor's Vegetables * Supermarket*[a]	-0.0052	χ^2	2159.9
Female	-0.1108	McFadden pseudo-R^2	0.27465
Child ≤ 8 years old	0.2382***		
Child 9 to 15 years old	0.1156		

*, ** and *** significant at the 0.10, 0.05, and 0.01 level, respectively. The results are from effect codes produced by R 2.14.2. RPL model was estimated with Halton draws 100 replications for simulated probability.
[a] reference levels of the attributes, the coefficients was calculated by: coefficient (ref.lev.) = - Σ coefficients (attribute levels)

Having at least one child aged 8 years old or younger has significantly positive effect on the probability to buy Chinese cabbage, while having at least one child aged 9-15 years old has no statistical significant effect on the probability to buy. The coefficient for purchasing fresh vegetables 2-3 times a week and shopping at fresh market are significantly negative indicating that an increasing of frequency of buying per week and shopping at fresh market will decrease the consumer's utility and lower the likelihood to buy. Being female or male have no significant effect on the probability to buy. With regard to the interaction terms, two significant interactions were found: Claimed*Fresh market and Q mark*Fresh market. Furthermore, the estimated parameter of the interaction term “Claimed*Fresh market” is significantly different from “Q mark*Fresh market”. The interaction between Claimed “Safe Produce” label and fresh market is positive, suggesting that consumers shopping at fresh market give more positive valuation for product with claimed label rather than consumers shopping at supermarket. On the other hand, the interaction between Q mark and fresh market

is negative, indicating that Q mark reduces the value of the product for consumers shopping at fresh market compared to consumer shopping at supermarket. This might be due to the fact that Q mark label is not commonly found at fresh market but rather distributed through supermarket, while Claimed "Safe Produce" label is common at fresh market.

The RPL model, which allows preference heterogeneity among consumers, better fits the data than other models, and standard deviations of brand & labelled attributes are statistically significant, thus suggesting that heterogeneity is an important issue to take into account.

4.3 Average WTP for food safety label on Chinese cabbage

The average WTP estimating using the RPL model is shown in Table 4. Consumers are willing to pay a large premium for branded & labelled cabbages relative to cabbage without information. This means that products with Q mark, Royal Project & Q mark and Doctor's Vegetables & Q mark are strongly preferred and would certainly gain a premium in the market relative to cabbage without any information. Claimed “Safe Produce” also gain premium price, but it is smaller than the others. The premium for the Doctor's Vegetables & Q mark attribute is slightly higher than the others but the difference is not significant. The WTP estimations for the three food safety labelling options look quite similar.

Table 4. WTP estimates for food safety brand & labels on Chinese cabbage.

Attribute	WTP_{RPL} (baht/kg)
Claimed "Safe Produce"	58.61 (117.22%)
Q mark	87.81 (175.62%)
Royal project & Q mark	88.47 (176.94%)
Doctor's Vegetables & Q mark	90.06 (180.12%)

No information (no brand & label) is a reference point. % premium are presented in parentheses.
% premium calculated according to the average price for Chinese Cabbage in baht/kg (50 baht/kg) in Bangkok in June-July 2013 [Department of Internal Trade (DIT, 2013)].
In July 2013, 1 US Dollar = 31.13 Thai baht (BHT).

5. Discussion and conclusions

We assessed Thai consumers' preferences and WTP for food safety labels and other relevant attributes of fresh Chinese cabbage using a discrete choice experiment. We found that freshness, price, and brand & label are all relevant attributes to Thai consumers. Conforming with previous studies (Gorton et al., 2011), freshness is the most important attribute affecting Thai consumers decision to buy fresh produce, followed by brand & label, and price. With respect to socio-demographic and consumption habits, having at least one child aged 8 years old or less and shopping at supermarket are positive factors to buy Chinese cabbage, whilst high frequency of buying fresh produce reduce the probability to choose one of the proposed options. Claimed "Safe Produce" label has more value at fresh market than at supermarket whilst Q mark has more value at supermarket than at fresh market. The possible explanation is that at fresh market claimed label is more common than other brands and labels, whereas, consumers at supermarkets are more familiar to products with brands and labels (Schipmann and Qaim, 2011).

The results suggest that surveyed consumers are willing to pay a premium for Q mark, Royal Project & Q mark, and Doctor's Vegetables& Q mark labelled products over unlabelled ones. They are also ready to pay a lower premium for Claimed "Safe Produce" label, showing that they do need to be reassured about food safety and perhaps that they trust the seller who make the claims. This finding implies that when providing information about enhanced procedures food safety with certain guarantees (by certification and/or brands or, at a lower degree, simply with a claim), consumers are better off. Thus, food safety labels based on a reliable and properly enforced quality assurance system would be socially desirable, since

they could reduce asymmetric information between seller and buyer and reduce searching time and cost for consumers (Caswell, 1998; Giannakas, 2002; Jahn, Schramm and Spiller, 2005).

The high premium prices (117% to 180% compared to regular market prices) in this study indicate a strong perceived need to have safer food available on the market and social desirability to be informed by food safety label. In other words, Thai consumers have low confidence on food safety of fresh produce products in the market or have low trust on the mandatory regulation, so they search for an “extra” guarantee in term of certification or well-known brands (Henson and Northen, 2000; De Jonge et al., 2007). This is a common situation happening in developing countries, especially in metropolitan areas such as Beijing, Shanghai (Ortega et al., 2011), Hanoi (Mergenthaler, Weinberger and Qaim, 2009), etc., where domestic food market is undergoing profound transformation from commodity to high-value products but food safety scandals are still recurrent. As a result, consumers in these areas have higher willingness-to-pay for “safer food”; hence, additional “safety” attribute (e.g., certificate and traceability labels) can be used as a quality signal and marketing tool in these markets. Although food safety should not be used as marketing argument because it is a consumer right to have safe food and the public authorities have to provide and ensure it, however, in certain situations (for instance, the emergence of severe food safety incidents which damage food industry or the government authorities could not provide trustworthy food safety assurance system), additional food safety may become a differentiating attribute (Canavari, Castellini and Spadoni, 2010). In the latter case, hence, if the government is not able to increase its investments in enhancing the overall food safety level, the food safety label policy should be supported and continued in order to improve the market of safe fresh produce products.

The results show that there is no significant difference among government-led and a combination of well-known private brands with the government-led label, suggesting that both government labels and private brands have a chance to succeed in the market. As a matter of fact, we found that general consumers are willing to pay more or less the same for any combination of guaranteed brands and labels we proposed. This could imply that, perhaps, the type of brand & label does not matter, they are just satisfied with an additional guarantee. This might infer that for consumers one food safety label is enough and adding other labels or brands does not increase utility of consumers. We cannot exclude, however, that these results derive from clustered and polarized preferences, that can be investigated using a different approach.

Consumers' indifferent feeling toward brands and labels could bring benefits and drawbacks. The positive aspect is that there is room for food safety labels in the fresh produce market. Private sector could use food safety labels to signal to consumers that products are safe and trusted brands and labels could become a tool to differentiate products and to enhance competitiveness in the high-value market (Henson and Reardon, 2005). On the other hand, the need for reassurance may provide market incentives to introduce/use fake or self-claimed labels as well, if consumers do not receive correct information or are not well-informed regarding the labels. It should be noted that surveyed consumers place less value on claimed label than on the other labels because we informed them in advance about the meaning of "claimed" label. In the study, surveyed consumers were in the position to understand that claimed labels do not possess any real guarantee in terms of certification, but it was only based on trust in the claimer; however, they give some additional value to claimed safety compared to no information.

Our results suggest that there is a strongly perceived need for a higher level of food safety in the fresh produce supply chain. Therefore, a potential market for fresh produce bearing

food safety labels could be envisaged, and such labels can be used to differentiate from competitors. Producers applying for foods safety certifications and labels should have a better chance to approach (especially large) retailers in the middle and high-end markets. This is confirmed by the fact that five large retail chains (Siam Makro, Central Food Retail, CP All, Tesco Lotus, and Big C) signed an agreement to support and distribute food products with ThaiGAP certifications (certification for good agricultural practices, which is one of the food safety certification applicable at farming level) (Thai Post, 2013).

Although surveyed consumers are in general concerned about food safety, they are heterogeneous in that their WTP for a price premium to cover the cost of providing safety attributes varies considerably. The results from the RPL model also suggest that there is heterogeneity among consumers' preference for brand & label attributes, particularly for Royal Project & Q mark and Doctor's Vegetables& Q mark labelled products. Hence, probably there are market segments preferring different food safety guarantees. Future research could also try to use alternative segmentation approaches (e.g., latent class modelling) to identify key market segments for the product and include the consumption habits, lifestyle and knowledge about food safety label since it is possible that these variables could be important determinants of Thai consumers' WTP. Consumers' perception toward food safety & label and its effect on consumers' preferences should be tested as well. Furthermore, the impact of information of brand & label on consumers' preferences should be tested to confirm our assumption regarding importance of information for food safety label policy. Since the respondents in this study are mainly from the city of Bangkok and vicinity, the study findings cannot be generalized to Thailand as a whole. However, the results can serve as an input for a wider study to be extended in other areas of Thailand and also other developing countries where food safety is an issue for food market development. Although care must be taken when making conclusions based on a hypothetical choice experiment, our results generally indicate high price premia for food safety label. An important limitation is that, although we chose to put brand & label attributes together with the Q mark to be more realistic, the drawback is that with this design we cannot separate the effect of private brands (Royal Project and Doctor's Vegetables) from the effect of certification label (Q mark): we only know that the cumulated effect is not different from the effect of Q mark alone. In further research, brand attribute and label attribute could be separated in the experimental design in order to define the effect of each attributes on consumers' preferences.

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