# Consumers' Preferences and Willingness to Pay for Viet GAP Vegetables in Hanoi, Vietnam

# Nhung Thi Thai[1], Hai Tran Manh[2] and Kampanat Pensupar[3]

[1,2]*Faculty of Economics and Rural Development, Vietnam National University of Agriculture, Hanoi 10000, Vietnam*

[3]*Corresponding author, Faculty of Economics, Kasetsart University Bangkok 10900 Thailand. Email: fecoknp@ku.ac.th*

## ABSTRACT

This study was conducted to investigate Hanoi consumers' preferences and willingness to pay (WTP) for different attributes of Vietnamese Good Agricultural Practices (VietGAP) vegetables. The choice experiment method was employed with the four selected attributes of VietGAP vegetables including the availability, quality certification label, traceability information, and price. Data were gathered from face-to-face interview of 300 shoppers in five supermarkets and six vegetable stores around the center of Hanoi city. Using mixed logit model, the findings revealed that, quality certification label is the most important characteristic for the respondents, followed by traceability information, and availability. Overall, consumers prefer VietGAP vegetables that are sold in supermarket systems, attached quality certification label certified by Non-Government Organizations (NGOs), added more traceability information covering farming, distribution and processing, and circulation and marketing. The WTP is the highest amount of money for organic certification label certified by NGOs attribute and lowest amount for VietGAP vegetables without label. As a result, the study recommends that (i) the direct participation of NGOs in the VietGAP standardized certification process should be encouraged; (ii) the Vietnamese government should improve the quality of their certification label by requiring extra strict criteria in certification process; (iii) the government should provide an adequate food traceability system as well as establishing a strong official sanctions enforcement mechanism in case of non-compliance.

*Keywords:* Consumers' preferences, VietGAP vegetables, choice experiment, willingness to pay.

## 1. INTRODUCTION

Food safety risks are a worldwide problem, the essential characteristic of which is associated with chemical-based agriculture. In order to increase yields, more and more farmers have been applying excessive amounts

of chemical fertilizers and the overuse of dangerous pesticides in their agricultural practices. They have raised public concerns over negative influence on health for both farmers and consumers, as well as high risks to environment (Simmons & Scott, 2011; Probst, Houedjofonon, Ayerakwa, & Haas, 2012; Chung & Dung, 2014). This has gained increasing attention amongst nation-states and international organizations (Hoi, Mol, & Oosterveer, 2009a; Hoi, Mol, Oosterveer, & Van Den Brink, 2009b). Nation-states have made various efforts to solve this issue by decreasing the use of fertilizers and synthetic pesticides in agriculture. Many developed countries has achieved this goal while the hazards pertain to food safety risks have been imposing a burden on developing countries (Henson, 2003; Organization for Economic Co-operation and Development [OECD], 2008).

Many ASEAN countries have been establishing GAP program as a popular tool in food safety risk reduction. Most of them have adopted the Global GAP and they have country versions of national GAP standards, but the ways of application have carried out differently from each other (Nabeshima, Michida, Vu, & Suzuki, 2015). Several schemes or certification systems are operated by the government departments, for example Malaysia, Thailand, Singapore, and Philippines, while some others are operated by private sector (Food and Agriculture Organization [FAO], 2014). They can be used separately or partially combination together in the conducting process depending on the situation in each countries (Thuan, Nhuan, Vy, Ha, & Thanh, 2010). In some other ASEAN countries as Brunei Darussalam, Cambodia, Laos PDR, and Myanmar, the national GAP standards are at various stages of development, some of which are in the beginning process with awareness programs for farmers.

In Vietnam, food safety risks have started to be one of the most concern and priority issues since 1990s. However, food safety risk reduction has still not brought significant results as expected (Sarter, Ha, & Anh, 2012). The data of food poisoning cases in Vietnam have not decreased during period from 2000 to 2010. The total number of outbreaks was over 2000, in which 60,602 people were infected and 583 died (Sarter et al., 2012). Chronic pesticide poisoning caused by the direct and indirect exposure to pesticide also has an effect on two million Vietnamese farmers (Oanh, 2005). Besides, according to World Bank (2006), the annual costs of pesticide-related domestic human health and of lost export opportunities for vegetables and fruits was estimated at US$700 millions. Vietnamese people therefore have started to be aware of these food safety risks and health problems from agricultural practices because of better educated population and modern lifestyle. Consumers have shifted recently their behavior on choosing safe food.

Vegetable is the second most important foodstuff consumed in Vietnam after rice, but the amount of pesticides used per hectare in vegetable production is the highest level among crops (Hoi et al., 2009b). A report of Inspections Authority revealed that vegetables are contaminated with a high quantity of pesticides (including banned pesticides), nitrates and heavy metals (Hoang & Nakayasu, 2006). Also, an investigation carried out by the Institute of Policy and Strategy for Agriculture and Rural Development showed that of the 1,050 samples of three types of vegetables collected from eight provinces, 51% of the sampled vegetables contained heavy metals and residues of plant protection chemicals (Chau, 2015). Thuan et al. (2010) also claimed that the microbiological pollution, toxic chemicals, heavy metals and pesticide residues on vegetables have caused serious impacts on public health in the immediate future and long term. These problems lead to consumers' consideration to health risk which they are facing.

In efforts to cope with these problems, Vietnamese Government has implemented "safe vegetables" program since 1995 (Mergenthaler, Weinberger, & Qaim, 2009). Subsequently, the Ministry of Agriculture

and Rural Development (MARD) issued the "Temporary Regulation for the Production of Safe Vegetables" (Decision 67/1998/QD-BNN-KHCN) in 1998. Lastly, the Decision 379/2008/QD-BNN-KHCN was promulgated by MARD to establish VietGAP as the main standard and guidelines for safe fruit and vegetable production. VietGAP is a voluntary application process which was based on ASEANGAP. It is aimed at preventing or minimising the potential hazards which occur during production, harvesting and post-harvest handling of fruits and vegetables. The hazards covered in VietGAP include food safety, produce quality, environmental impacts and health, safety and welfare for Vietnamese workers (MARD, 2008).

After nearly eight years of implementation, the VietGAP program has proven that it is a good program for reducing health problems caused by pesticide exposure (Chau, 2015). However, this program still faces a number of limitations and development challenges in some aspects. Firstly, within the program, products are sold through only specialized supply chains in a limited number of VietGAP vegetable shops and supermarkets. Secondly, although in cooperation with local authorities, the "VietGAP vegetable" label is also promoted through annual fairs for farmers and through advertising programs for retailers and consumers, the establishment of quality certification label still falls short of expectations. Most labeling in the area of food safety still relates to "safe vegetables" rather than VietGAP vegetables (Wang, Moustier, & Loc, 2014). Thirdly, after initial external controls and issuance of certificates, quality controls are mostly organized in an internal participation within cooperatives without external authentication at all (Mergenthaler et al., 2009). Giving the VietGAP vegetable certification is not verified by a standardized certification process, and no official sanction mechanisms are provided in case of non-compliance (Moustier, Figuié, Loc, & Son, 2005). The lack of standard enforcement mechanisms leads to the asymmetric information between producers and consumers. Producers frequently complain about the strong inconsistency in their income with the prices of VietGAP vegetables on the market. Meanwhile, consumers are still deeply distrust on safety of VietGAP vegetables. As a consequence, after every efforts and investments by state authorities and market actors, VietGAP vegetable distribution system has not been able to take a considerable share of vegetable market and obtain widespread consumer trust yet (Hoi et al., 2009a). Potential growth of VietGAP vegetables from the described supply chains is severely hampered (Hoang & Nakayasu, 2006). These problems raise a policy suggestion for possible bridging of the information gap between producers and consumers, which enhances consumer confidence in terms of quality (Wang et al., 2014; Chau, 2015).

Hanoi, a city located at the center of the Red River delta in Vietnam, was selected as a pilot for Safe Vegetables program for its majority market of vegetable consumption in Vietnam. According to data provided by MARD (2015), the demand for green vegetables in Hanoi is 950,000 ton/year. However, most vegetables available in Hanoi are produced in peri-urban zones where farmers use increased quantities of fertilizer and pesticide to maximize productivity per hectare due to the land size limitation (Moustier et al., 2005; Wang et al., 2014), only about 30% of the area for vegetable production in Hanoi are controlled and safety certified by the government; therefore it is difficult for consumers to access these safe foods (Hai, Moritaka, & Fukuda, 2013). That explains why consumers do not believe the safety of vegetables even VietGAP vegetables. As evidence, the proportion of safe vegetables sold is less than 5% of household consumption and less than 2% of production (Moustier & Figuié, 2003). It is important to seek consumers' preferences and WTP for various characteristics of VietGAP vegetables, but still limited number of studies on these aspects. Most existing studies focus problems on VietGAP vegetable production (Moustier et al., 2005; Oanh, 2005; Hoi et al., 2009b; Nicetic, Van De Fliert, Chien, Mai, & Cuong, 2010; Thuan et al., 2010;

Chau, 2015). Hence, the purpose of this research is to elicit preferences and WTP of Hanoi consumers for different attributes of VietGAP vegetables by using choice experiment method. There are to date only few choice experiment application to safe foods in Vietnam, especially rare in Hanoi city to our knowledge. This study provides a valuable addition to this scant aspect. These determinants are essential, not only for meeting the increasing demand of consumers, orienting for stakeholders in providing their products in the markets, but also useful for policy makers to promote VietGAP vegetable market in Vietnam.

This paper is organized as follows. The next section provides a detail the materials and methods used in the study. Choice experimental design as well as data collection are described in this part. In the third part, the main results and discussions are subsequently presented. Finally, the paper concludes with some implications of the findings for policy recommendations.

## 2. METHODS

### Choice Experiment Method

When we consider individual's preferences, studies conventionally used two approaches: (i) revealed preference techniques and (ii) stated preference techniques. Among them, the first term focuses on observing actual choices made by individual to capture preferences while the second term emphasizes on hypothetical choices made by asking people the monetary value that they placed on goods. In this study, the stated preference method is employed due to still small market for VietGAP vegetables; there is no revealed data for estimating the monetary amount that consumers would be willing to pay for adding new products' attributes. Of the stated preference techniques, the choice experiment has been widely employed to explore consumers' preferences for multi-attribute products, especially non-monetary attributes (Bonilla, 2010). This study therefore utilizes choice experiment as a main approach in order to elicit Hanoi consumers' preferences and WTP for various attributes of VietGAP vegetables.

In terms of welfare consistent estimate, choice experiment was used in this study due to its suitability. First, respondents can choose between two alternatives versus the status quo (a baseline alternative which is usually involved in each choice set and produces welfare-consistent estimate) at no extra cost to them. Second, respondents are not directly asked to express their monetary values on VietGAP vegetables, it allows the respondents to make a trade-off between the changes in attribute level and the cost of creating these changes. Third, the econometric technique is employed precisely parallel to the rational theory, probabilistic choice. Finally, we estimate compensating surplus from the output of the technique (Bateman et al., 2002). Several studies have documented some advantages of using choice experiments including: (1) the ability to derive the WTP estimates for a bundle of attributes, rather than just a single attribute, (2) lower cost compared to experimental auctions methods but still mimics the typical shopping experience, and (3) the results gained from choice experiment data and those from actual data are not so different.

Choice experiment has a theoretical grounding in Lancaster's characteristics theory of value and random utility theory. First, following Lancaster (1966), who initiated the consumer choice theory by proposing the idea that "each good in the choice set involves a bundle of attributes or characteristics and the levels they take". Consumers' preferences for goods are not direct from goods themselves, they are derived from attributes of goods. Second, the random utility theory (McFadden, 1973) postulates that, an individual's utility is a latent construct that exists in the consumer's mind but that can be separated into two

parts: (1) a deterministic element or observable aspects of the utility including the attributes of products and the individual's characteristics, $V_{ijt}$, and (2) a stochastic or unobservable aspects, $\varepsilon_{ijt}$. The unobservable components are also assumed to have all the attributes of the products and characteristics of the individual that may be unknown or unobserved, which are treated as a random component (Becker, 1976). Thus, a consumer $i$, derives the utility, $U_{ijt}$ from choosing alternative $j$ from a limit set of feasible J alternatives contained in choice set $C$ in situation $t$, his/her utility of choice can be represented as function:

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} \tag{1}$$

Consumer $i$ therefore will select the group of attributes of a good that maximizes his/her utility subject to a budget constraint and time limitation. More concretely, the probability that consumer $i$ chooses alternative $j$ rather than alternative $q$ is given by:

$$P_{ijt} = \text{Prob } (V_{ijt} + \varepsilon_{ijt} > V_{iqt} + \varepsilon_{iqt}; \; \forall \; j \neq q; j, q \in C) \tag{2}$$

$$P_{ijt} = \text{Prob } (V_{ijt} - V_{iqt} > \varepsilon_{iqt} - \varepsilon_{ijt}; \; \forall \; j \neq q; j, q \in C) \tag{3}$$

Random utility models are gained from the specificity of a probability distribution of two disturbances $(\varepsilon_i = \varepsilon_{iq} - \varepsilon_{ij})$ which most usually utilized forms are normal distribution and logistic distribution. The probit model will be used if it is assumed that is a standard normal distribution function, otherwise the logit model will be used if $\varepsilon_i = \varepsilon_{iq} - \varepsilon_{ij}$ is independently and identically distributed (IID) as a type I extreme value (Sriwaranun, 2011). Among logit models, mixed logit or random parameters logit allows the stochastic elements to follow any distribution. It can approximate any random utility model, also relaxes the Independence of Irrelevance Alternatives (IIA) assumption, and further examines the sources of heterogeneity among respondents (Train, 2003).

Under mixed logit, the deterministic element of utility takes the linear form of $V_{ijt} = \beta' X_{ijt}$. Where $\beta'$ is vector of random parameters indicating individual preferences, and $X_{ijt}$ is the vector of attributes found in the $j^{th}$ alternative. The parameters vary over respondents with probability density function of $\beta$, $f(\beta)$, as the mixing distribution (Train, 2003). In this case, the probability that consumer $i$ selects alternative $j$ from the choice set C under choice situation $t$ can be expressed as follows:

$$P_{ijt} = \int \frac{\exp(V_{ijt})}{\sum_q \exp(V_{iqt})} \; f(\beta) d\beta \tag{4}$$

This probability is a weighted average of the logit formula evaluated at different values of $\beta$. Moreover, in the mixed logit model estimation, the log-likelihood technique cannot be used analytically because the choice probability in equation (4) does not have a closed form. Hence, it is approximated using simulation methods. Specifically, several draws of $\beta$ is taken from its density $f(\beta)$. For each draw, the standard logit is calculated, and the results are averaged over draws.

In choice models, the coefficients cannot directly explain the effect of respective independent variables on the probability of selecting each particular alternative. Each of the explanatory variables on the linear indirect utility function is needed to combine the identification of monetary values related to the change in each attribute level. After estimating the parameters of the linear utility function, the implicit price or marginal WTP can be calculated as a negative ratio of attribute level coefficient to the estimated price coefficient. Computation of the implicit price or marginal WTP for each attribute of alternative $j$ is

$$\text{WTP}_j = \text{Implicit Price} = -\frac{\beta_{\text{attribute}}}{\delta} \tag{5}$$

where, $\beta_{\text{attribute}}$ coefficient is relevant to the attribute of interest to be estimated; $\delta$ is the coefficient of PRICE. Each of these ratios implies as a price change associated with a unit increase in a given attribute (Loureiro & Umberger, 2007). In other words, the ratio in equation (5) indicates a marginal willingness to pay or marginal rate of substitution between each vegetable attribute and money.

## Choice Experimental Design and Data Collection

### Choice Experimental Design

There are four main steps in designing choice experiment. First, the relevant attributes and their levels are identified during discussion with market research experts of the Fruit and Vegetable Research Institutes and focus group discussion with consumers in Hanoi city. Specifically, a number of consumers were chosen from random people entering the produce sections of the supermarkets and vegetable stores. We recognize what are the most important characteristics of vegetables that respondents consider, how they can be defined, and how much they willing to pay for adding new attributes. We also combine several debates about these attributes in some previous studies regarding consumers' preferences toward food attributes and their WTP (Cicia, Del Giudice, & Scarpa, 2002; Hearne & Volcan, 2002; Ara, 2003; Onozaka, Bunch, & Larson, 2006; Loureiro & Umberger, 2007; Yue & Tong, 2009; Bonilla, 2010; Ortega, Wang, Wu, & Olynk, 2011; Huong, 2012; Mac & Trung, 2014; Sporleder, Kayser, Friedrich, & Theuvsen, 2014; Bi, Gao, House, & Hausmann, 2015; Wu, Wang, Zhu, Hu, & Wang, 2015). As a result, four main attributes of VietGAP vegetables were employed that could most impact the Hanoi consumers' preferences and their WTP including availability, quality certification label, traceability information, and price. The descriptions of the attributes and their levels are shown in Table 1.

The first attribute, the availability, is one of the obstacles to consumers to approach VietGAP vegetables due to specialized supply chains in a limited number of vegetable shops and supermarkets. Information of VietGAP vegetables in Hanoi is currently so limited that makes consumers confusion over vegetable labelling.

Certification label is also highly paid attention by many consumers because Vietnam has not had the common label for VietGAP vegetables (Duong, 2012). There are too many labels of different producers on the market, consumers are uncertain whether adding more labels on product indicating a healthy and safe vegetable or not. In this study, VietGAP certification in effect is a bundle of attributes itself that is coalesced into an attribute. It is certified by government organizations along with criteria following MARD (2008). Meanwhile, Organic certification is certified by NGOs along with criteria following Participatory Guarantee Systems (PGS) organic standards. They are drafted by the PGS Coordination Committee in line with International Foundation for Organic Agriculture Movements (IFOAM) basic standards. A difference approach between organic certification and other certification is that the direct participation of farmers and consumers in the certification process is encouraged or even required by PGS.

Food traceability system is considered as a main method for the fundamental prevention of food safety risks (Wu et al., 2015). Hence, consumers express their strong concern about the traceability information cover extensive supply chain processes of vegetables. Food safety risks can appear throughout the VietGAP vegetable supply chain processes. This attribute therefore captures four levels from untraceable information until traceability information covering farming distribution and processing, and circulation and marketing.

**Table 1**
**VietGAP vegetable attributes and their levels**

| *Attributes* | *Levels* | *Description* |
|---|---|---|
| Availability (AVA) | 1. Fresh markets *(status quo)* <br> 2. Stores (AVA1) <br> 3. Supermarkets (AVA2) | Whether vegetables occur in supermarkets, vegetable stores or fresh markets. |
| Quality certification label (LAB) | 1. Without label *(status quo)* <br> 2. VietGAP without label (LAB1) <br> 3. VietGAP label is certified by Government (LAB2) <br> 4. Organic label is certified by NGOs (LAB3) | Whether vegetables are certified or not. VietGAP certification label presents the vegetable quality adopting VietGAP standard following MARD (2008). VietGAP vegetables without label means that there are no certification labels on vegetables even these products followed VietGAP standard. Organic certification label indicates vegetable quality adopting Participatory Guarantee Systems (PGS) which obeyed the IFOAM. |
| Traceability information (TRACE) | 1. Untraceable *(status quo)* <br> 2. Traceability information covering farming (TRACE1) <br> 3. Traceability information covering farming, distribution and processing (TRACE2) <br> 4. Traceability information covering farming, distribution and processing, circulation and marketing (TRACE3) | Farming information covers vegetable farm such as farming environment, cultivation, pesticide usage, and harvest time; information of distribution and processing covers packing time, location of packing and processing; information of circulation and marketing, covers wholesaler, transportation, bearer, and retailer. |
| Price (PRICE) | 10,000 VND/kg (0.45 USD)[a] *(status quo)* <br> 13,000 VND/kg (0.59 USD) <br> 17,000 VND/kg (0.77 USD) <br> 22,000 VND/kg (1 USD) | The price that respondents were willing to pay for one kilogram of leafy mustard or choysum in pretest result. |

*Note*: [a]The exchange rate was roughly of 22,000VND for one USD during February – March 2016.

Price is identified to imply the marginal value of different attribute levels of products. Leafy vegetable types contribute about one-half of the total quantities of vegetable groups which are consumed daily by consumers in Hanoi city (Chen, 2007). Two types of representative vegetables, namely leafy mustard and choysum, are selected in setting the prices due to (i) they are one of the first vegetables awarded the VietGAP certification by Fruit and Vegetable Research Institute in 2009 (Thuan et al., 2010); (ii) these vegetables are bought and consumed regularly by most Hanoi consumers during survey period (from February to March 2016); (iii) almost participants express their concerns over food safety issues due to pesticide misuse in these vegetables; and (iv) they have the same price, taste, size, and usage, these vegetables can substitute each other. We asked the respondents directly that how much they would be willing to pay for one kilogram of leafy mustard or choysum if these vegetables are added more information about availability, quality certification label, and traceability. The scales of prices are defined through the result of pretest in December 2015.

Moreover, the *status quo* in Table 1 indicates the ordinary vegetable in fresh market, without quality certification label as well as without traceability information being sold at market price that respondents purchase regularly.

After defining key attributes and their levels, a full factorial design encompasses all alternatives that can be created from the combinations of these attribute levels. A total of 3 x 4 x 4 x 4 = 192 vegetable profiles can be gained according to the setting as mentioned in Table 1. However, we utilized an orthogonal

fractional factorial design to minimize the number of choices due to the avoidance of complexity associated with a large number of choice sets which can affect respondent decisions in a short time. In all, only sixteen manageable possible profiles in these orthogonal designs are generated. These profiles are paired off eight choice sets; these are then blocked into two versions, each containing four choice sets in each questionnaire. In each choice set, the respondents are presented two alternatives versus the *status quo* carefully, and afterwards they are asked to repeatedly choose from four hypothetical constructed choice sets and make a trade-off among different attributes. Based on the most preferred alternative in each choice set, the probability of an alternative being chosen with respect to differences in attributes is computed. In other words, by observing the decision to choose the most preferred alternative among three alternatives in each choice set from the same respondent, we can explore his/her preference for each of the major attributes with respective levels. Finally, the mixed logit model is estimated by using the 300 x 4 = 1,200 answered choice sets, and the 300 x 4 x 3 = 3,600 observations.

## Data Collection

The empirical data for this study was collected from face-to-face interviews in five big supermarkets and six vegetable stores chosen by a random selection of zones on a map in metropolitan Hanoi city. A total of 300 consumers, who are primary food shoppers in their household, have been selected randomly as they entered these supermarkets or stores in order to minimize the selection bias. Approximately 70% of respondents are from supermarkets and 30% of tested person are from vegetable stores. They are not only consumers who have ever bought VietGAP vegetables for the last three years but also consumers who have never bought VietGAP vegetables before. The survey is carried out over two months from early February to the end of March 2016.

The questionnaire was organized in three parts. After some questions related to vegetable purchasing for their household and VietGAP vegetable purchase, we made an effort to gather information regarding consumers' preferences for different attributes of VietGAP vegetables using choice experiment. In this part, after the introduction to the choice experiment, the participants were asked to answer four choice set questions as mentioned in experimental design above. Each choice set is designed by pictures as well as word descriptions to ensure that respondent understood the choice card clearly. Finally, some general information related to socio-economic characteristics of respondents is also inquired.

## Data Analysis

Descriptive statistics were used to describe the social and economic characteristics of the respondents as well as their behavior in vegetable purchasing. Next, the choice experiment model was employed to analyze consumers' preferences and willingness to pay for VietGAP vegetable attributes. The empirical model of the indirect utility levels fundamental to the mixed logit model at the attributes of each choice. The dependent variable is a dummy variable that equals to one if an option in a choice set was selected and zero if otherwise.

$$V_{ni} = \beta_n AVA1_{ni} + \beta_n AVA2_{ni} + \beta_n LAB1_{ni} + \beta_n LAB2_{ni} + \beta_n LAB3_{ni} + \beta_n TRACE1_{ni}$$
$$+ \beta_n TRACE2_{ni} + \beta_n TRACE3_{ni} + \delta_i PRICE_i \qquad (6)$$

where, $V_{ni}$ is the observable utility level that consumer $n^{th}$ gets from choosing the $i^{th}$ vegetable characteristic. These parameters are estimated by Maximum Simulated Likelihood Techniques. The description of variables is represented in the Table 2.

All independent variables are estimated as random parameters. After estimation of the model, we will calculate the WTP for each attribute by using equation (5).

**Table 2**
**Definition of variables**

| Variables | Symbol | Description |
|---|---|---|
| Availability | AVA1 | 1 = vegetables are available in stores;<br>0 = otherwise |
| | AVA2 | 1 = vegetables are available in supermarkets;<br>0 = otherwise |
| Certification label | LAB1 | 1 = VietGAP without label;<br>0 = otherwise |
| | LAB2 | 1 = VietGAP label is certified by the Government;<br>0 = otherwise |
| | LAB3 | 1 = organic label is certified by NGOs;<br>0 = otherwise |
| Traceability information | TRACE1 | 1 = traceability information covering farming;<br>0 = otherwise |
| | TRACE2 | 1 = traceability information covering farming, distribution and processing;<br>0 = otherwise |
| | TRACE3 | 1 = traceability information covering farming, distribution, processing, circulation and marketing;<br>0 = otherwise |
| Price | PRICE | The different price levels which compared the current market prices |

## 3. RESULTS AND DISCUSSION

### Descriptive Statistics Results

The sample description is presented in Table 3. Our 300 sample includes 60 respondents (20%) who always or often buy VietGAP vegetables every month and 240 (80%) respondents who have never bought VietGAP vegetables during last three years or who sometimes or rarely buy VietGAP vegetables each month. The rate of purchasers still makes up a small quantity compared to non-purchasers.

The respondents in two groups are relatively homogenous in terms of socio-demographic characteristics. Concretely, 70% of purchasers are in the age group of 25 to 40 years old while this rate is 67.5% for non-purchaser respondents. Moreover, 85% of the respondents are female, 15% of them are male, and 74.3% of them have children under the age of 18 years old. The average number of children in purchaser group is higher than non-purchaser group. It is also observed that the respondents' education level is very high (71.3% of the respondents had completed undergraduate degree), which is expected since they constitute the minority of consumers who purchase VietGAP vegetables in potentiality. Moreover, 41.7% of purchasers are government officers, 35.0% of them are working in private companies, and only 5.0% people are housewife

**Table 3**
**Socio-demographic characteristics of respondents**

| *Variable* | *Groups* | *Purchasers*[a] | *Non-purchasers*[b] | *Total* |
|---|---|---|---|---|
| Number of observations | | 60 | 240 | 300 |
| Age (%) | 18 – 24 years | 3.3 | 17.1 | 14.3 |
| | 25 – 40 years | 70.0 | 67.5 | 68.0 |
| | 41 – 54 years | 21.7 | 12.9 | 14.7 |
| | 55 years and older | 5.0 | 2.5 | 3.0 |
| Gender (%) | Female | 90.0 | 83.8 | 85.00 |
| | Male | 10.0 | 16.2 | 15.00 |
| Number of children (people) | | 1.48 | 1.07 | 1.15 |
| Education level (%) | High school or less | 5.0 | 7.1 | 6.7 |
| | Undergraduate | 75.0 | 70.4 | 71.3 |
| | Graduate | 20.0 | 22.5 | 22.0 |
| Occupation (%) | Government officer | 41.7 | 37.5 | 38.3 |
| | Private company officer | 35.0 | 28.7 | 30.0 |
| | Self-employed | 16.7 | 12.9 | 13.7 |
| | Housewife/husband | 5.0 | 7.1 | 6.7 |
| | Retired | 1.7 | 1.3 | 1.3 |
| | Other(s) | 0 | 12.5 | 10.0 |
| Household size (people) | | 4.47 | 4.10 | 4.19 |
| Household income per month (000VND)[c] (%) | Less than 10,000 | 5.0 | 19.6 | 16.7 |
| | 10,000 – 20,000 | 26.7 | 46.7 | 42.7 |
| | 20,000 – 30,000 | 35.0 | 23.7 | 26.0 |
| | More than 30,000 | 33.3 | 10.0 | 14.6 |

*Note*: [a]Purchasers of VietGAP vegetables refer to respondents who always or often buy VietGAP vegetables every month;
[b]Non-purchaers of VietGAP vegetables refer to respondents who have never bought VietGAP vegetables during last three years or who sometimes or rarely buy VietGAP vegetables each month;
[c]The exchange rate was roughly of 22,000VND for one USD during February – March 2016.
*Source:* Calculated from field survey data 2016.

while these proportions of non-purchasers are 37.5%, 28.7%, and 7.1% respectively. Thus, the purchasers are working in government organizations and private company more than that number of non-purchasers. Almost respondents have a family size which is less than five people (4.19 people) and a monthly income of 10 million to 20 million VND per month (roughly of 454.5 – 909 USD per month in February 2016) (account for 42.67%). Overall, in comparison to the population statistics by (General Statistics Office of Vietnam [GSO], 2012) and GSO (2014), the age distribution, household size, and household income of total respondents are generally consistent, except a higher proportion of female, higher level of education and occupational distribution.

Regarding vegetable purchasing habits, the high buying frequency and small-scale purchase are main features of almost respondents. Nearly 70% of respondents usually buy vegetables more than three times per week. This rate of non-purchaser group is higher than that in the group of purchasers. Nearly 70% of respondents spend less than 20,000 VND (0.9 USD) per day on vegetables, of which the rate of non-

purchaser group (accounts for 79.2%) is much higher than that rate of purchaser group (31.6%). Some respondents have been purchasing VietGAP vegetables but few purchased VietGAP vegetables on a regular basis. The proportion of VietGAP vegetables in vegetable expenditure per month of one third of purchasers still make up a small quantity compared to conventional vegetable; approximately of 20 purchasers spend less than 50% of their vegetable expenditure for buying VietGAP vegetables. There is 66.7% of purchasers (approximately of 40 people) usually list VietGAP vegetables as their daily foods in meals (Table 4).

**Table 4**
**Consumers' behavior in vegetable purchasing**

|  | *Purchasers*[a] | *Non-purchasers*[b] | *Total* |
|---|---|---|---|
| Number of observations | 60 | 240 | 300 |
| Purchasing frequency (%) |  |  |  |
| Once a week | 8.3 | 6.7 | 7.0 |
| 2-3 times a week | 38.3 | 19.5 | 23.3 |
| More than 3 times a week | 53.4 | 73.8 | 69.7 |
| Vegetable expenditure per day (VND)[c] |  |  |  |
| Less than 10,000 | 3.3 | 7.5 | 6.7 |
| 10,000 – 20,000 | 28.3 | 71.7 | 63.0 |
| 21,000 – 30,000 | 40.1 | 13.3 | 18.7 |
| More than 30,000 | 28.3 | 7.5 | 11.7 |
| Proportion of VietGAP vegetable expenditure per month |  |  |  |
| Less than 10% | 3.3 | - | 3.3 |
| 10 – 30% | 11.7 | - | 11.7 |
| 30 – 50% | 18.3 | - | 18.3 |
| 50 – 70% | 45.0 | - | 45.0 |
| More than 70% | 21.7 | - | 21.7 |
| Place to purchase VietGAP vegetables |  |  |  |
| Supermarkets/hypermarkets | 65.0 | - | 65.0 |
| Vegetable stores/food shops | 30.0 | - | 30.0 |
| Fresh markets | 3.3 | - | 3.3 |
| Others | 1.7 | - | 1.7 |

*Note.* [a]Purchasers of VietGAP vegetables refer to respondents who always or often buy VietGAP vegetables every month;
[b]Non-purchaers of VietGAP vegetables refer to respondents who have never bought VietGAP vegetables during last three years or who sometimes or rarely buy VietGAP vegetables each month;
[c]The exchange rate was roughly of 22,000VND for one USD during February – March 2016.
*Source:* Calculated from field survey data 2016

The result of the survey also worth mentioning that buyers in supermarket consider mostly in quality certification label and traceability information while buyers in fresh markets consider mostly in price and relationship with sellers. In addition, the majority of respondents usually buy vegetables in the fresh markets or small roadside shops which close to place of work or their houses everyday due to their convenience rather than choice. There is 65% of purchasers who often buy VietGAP vegetables in supermarkets or hypermarkets, only 30% and 3.3% of purchasers who usually buy VietGAP vegetables in vegetable stores

and fresh markets, respectively. Whenever they go shopping in supermarkets, they often buy vegetables along with other foods which are enough for several days. Hence, to increase the access to VietGAP vegetables, in addition to having VietGAP vegetable stalls in supermarkets, marketers should also have more convenience shops in the fresh markets all over city where VietGAP vegetables are available alongside conventional vegetable produce.

## Consumers' Preferences for VietGAP Vegetables

Using 3,600 observations, 1,200 choice sets elicited from 300 respondents, the mixed logit model can be estimated by simulated maximum likelihood. Mixed Logit model allows the parameter estimations to vary across individuals and heterogeneity preferences among respondents can be defined through the standard deviation of the parameters. All of the vegetable attributes, except price, are specified to be independently normal distributed and distribution simulations are based on Halton draws with 500 replications. The estimated parameters of model are reported in Table 5.

**Table 5**
**Estimated coefficients of Mixed Logit model**

| Attributes | Variable name | Mean Coefficient | S.E[a]. of Mean Coefficient | S.D[b]. Coefficient | S.E. of S.D. Coefficient |
|---|---|---|---|---|---|
| Availability | AVA1 | 0.2186 | 0.1613 | 0.0241 | 0.4544 |
| | AVA2 | 1.2230[***] | 0.2158 | −0.0125 | 0.5625 |
| Quality certification label | LAB1 | 1.3088[***] | 0.2547 | 1.2828[***] | 0.3614 |
| | LAB2 | 2.3804[***] | 0.2532 | 1.0328[***] | 0.3338 |
| | LAB3 | 2.7833[***] | 0.3637 | 1.1547[***] | 0.4078 |
| Traceability information | TRACE1 | 1.8215[***] | 0.2352 | 1.3318[***] | 0.3501 |
| | TRACE2 | 2.0720[***] | 0.2892 | 0.4378 | 0.6107 |
| | TRACE3 | 2.3337[***] | 0.2617 | −0.7158[*] | 0.4149 |
| Price | PRICE | −0.2021[***] | 0.0417 | 0.2762[***] | 0.0383 |
| Log likehood | = | −1030.9554 | | | |
| LR Chi2(9) | = | 91.47 | | | |
| Prob > chi2 | = | 0.0000 | | | |
| Halton draws | = | 500 | | | |
| Number of observations | = | 3600 | | | |
| Number of respondents | = | 300 | | | |

*Note:* [***] significant at 1% level, * significant at 10% level;
[a]S.E. indicates the Standard Error; [b]S.D. indicates the Standard Deviation.
*Source:* Calculated from field survey data 2016

As a result, eight out of nine variables are highly statistically significant at 1% level except the variable *AVA1*. The relationship between all variables and the utility function is also as expected. It is possible that lack of information regarding these attributes might be the major constraint of VietGAP vegetable market. The positive signs of estimated mean coefficients are intuitively plausible, indicating positive changes of consumer's utility due to information improvement about availability, quality certification label, and traceability information in comparison with no information at all. Moreover, the estimated standard deviations of coefficients for six out of nine attribute levels are statistically significant, indicating the heterogeneity in preferences among the respondents over attribute levels.

First, there was a positive effect on the respondents' purchase behavior when organic certification label was certified by NGOs as compared to governmental certification label or no certification label at all. This result is in line with that of Wu et al. (2015), Birol, Roy, Deffner and Karandikar (2009), Loureiro and Umberger (2007), who found that consumers in their countries pay the most consideration on food safety certification label, followed by origin of foods. On the contrary, Cicia et al. (2002) revealed that certification has a fixed effect on the Italian consumers, only price is a considerable factor as quality proxy. Interestingly, Ara (2003) said that Philippine consumers, who live far from the farms, have a higher demand for organic rice certification more than consumers who live near to the farms.

Almost consumers prefer VietGAP vegetables that are guaranteed accurate traceability information from "farm to fork" (*TRACE3*). Therefore, "traceability information covering farming, distribution and processing, and circulation and marketing" brings about the highest utility compared to no traceability information at all. There is a smaller utility of respondents if traceability information covers only farming (*TRACE1*) or farming, distribution and processing (*TRACE2*). These results are as expected because without traceability system in any stage, no one guarantees that unsafe vegetables cannot infiltrate into VietGAP or organic vegetables in the process of farming, harvesting, distribution, processing, and marketing. It means that consumers still have a risk to be bought the unsafe vegetables with high price.

In addition, the sign of variable *AVA1* is positive but its mean coefficient is not statistically significant implying that VietGAP vegetables are sold more or less at vegetable stores, there is no substantial influence on utility of consumers. The standard deviation of *AVA1* is also not statistically significant indicating that there is not heterogeneity in preferences for this level of availability attribute. The coefficient of the variable *AVA2* reveals that consumers will increase their utility if VietGAP vegetables are sold more in supermarket systems. Thirty-six percent of respondents believe in vegetables in supermarkets more than other places like food stores or traditional fresh markets because at least these products are checked by the supermarket management system. Supermarket systems also provide a great variety of vegetables from many suppliers to choose and consumers can also buy other products when they go shopping.

The parameter of the variable *PRICE* is statistically significant at 1% level and negatively sign related to the utility. This direction obeys the law of demand theory which states that the more price increases the less utility can get. It means that the increasing increments on the price of vegetables will decrease the probability of choosing improved attributes in the choice set questions. In other words, the higher price is less likely to make Hanoi consumers purchase VietGAP vegetables.

## Mean Willingness to Pay for Different VietGAP Vegetable Attributes

Except for the significance and relative size, estimated coefficient values are not straightforward interpretation (Carlsson, Frykblom, & Liljenstolpe, 2003; Rattiya, 2010). We therefore can calculate the WTP or the marginal value of change (or price premium for a good) in a single vegetable attribute based on the estimated results in Table 5. Each of the estimation was computed by using the negative ratio of the coefficient associated with the attribute of interest over the estimated PRICE coefficient as mentioned in equation (5). This ratio represents the marginal rate of substitution between price and each of the vegetable attribute. The mean WTP was estimated by delta method following Greene (2008), which provided 95% confident interval of the value. The results are listed in Table 6.

First, consumers pay most attention to quality certification label attribute in comparison with rest of the attributes. They would be willing to pay the highest amount of money (13,770 VND/kg) for organic certification label certified by NGOs, followed by quality certification label certified by government organizations (11,780 VND/kg). The VietGAP vegetable without label carries a smallest WTP with the payment of 6,470 VND/kg. There has been a consistent finding in present study and the finding in Wu et al. (2015), who found that Chinese consumers showed the highest preference for quality certification, followed by appearance and traceability information on pork product. However, Chinese consumers preferred a quality certification certified by Government more than a quality certification certified by the third-party certification. These findings may also denote that the quality certification label is a compulsory requirement for consumers in order to purchase a vegetable product. This claim is the same as conclusion of Birol et al. (2009) who revealed that food safety certification should be mandatory criterion for all foodstuff in India, specifically grape. Indian consumers pay the most consideration for GlobalGAP certification, followed by taste, production method, and source of grapes.

**Table 6**
**Mean willingness to pay for each VietGAP vegetable attribute**

| *Attributes* | *Levels* | *WTP (000 VND/kg)[a]* | *S.E. of WTP[b]* |
|---|---|---|---|
| Availability | AVA2 | 6.05*** | 1.1019 |
| Quality certification label | LAB1 | 6.47*** | 1.2121 |
| | LAB2 | 11.78*** | 1.8861 |
| | LAB3 | 13.77*** | 1.8685 |
| Traceability information | TRACE1 | 9.01*** | 1.5788 |
| | TRACE2 | 10.25*** | 1.7478 |
| | TRACE3 | 11.55*** | 1.7698 |

*Note:* ***significant at 1% level
[a]The exchange rate was roughly of 22,000VND for one USD during February – March 2016;
[b]Standard errors are calculated via the delta method (Greene, 2008);
*Source:* Calculated from field survey data 2016

Next priority from consumers is the traceability information on vegetable products which is required to help consumers to determine the origin of products. Specifically, consumers would be willing to pay price premium of 11,550 VND/kg higher than conventional vegetable price (10,000 VND/kg) for VietGAP vegetable can be provided traceability information covering farming, distribution and processing, circulation and marketing. They are also willing to pay price primium of 10,250 VND per kilogram for VietGAP vegetable that can trace its origin covering farming, distribution and processing; only 9,010 VND/kg for VietGAP vegetable that can trace its origin covering farming. These findings are in accordance with the expectation of Hanoi consumers as mentioned in Mac and Trung (2014) that they have been paying much greater attention to the traceability information of vegetables. However, this research did not estimate how much they willing to pay for providing more traceability information.

Finally, the availability of vegetables is also an important factor influencing consumer purchase decisions although it is ranked near the last of respondent's consideration compared to quality certification label and traceability information. On average, consumers are willing to pay price premium of 6,050 VND/kg for increasing the availability of VietGAP vegetables in widespread supermarket systems, and therefore

they can purchase VietGAP vegetables easily. There are 57.14 percent of respondents in the group of non-purchasers who revealed that they could not find VietGAP vegetables to buy even though they want to buy. This conclusion is quite similar with the claim as mentioned in Hai et al. (2013) and Hearne and Volcan (2002) in terms of organic vegetables. These authors reconfirmed that lack of convenience and information are the main reasons for limitation in consumption of organic vegetables in Hanoi and Costa Rica respectively. Hence, it is necessary to emphasize the importance of having extensive promotional strategies to increase the VietGAP vegetable information channels. Retailers should provide consumers with recorded production processes as well as production standards through advertising in the pamphlets alongside VietGAP vegetables. Moreover, to expand the VietGAP vegetable market, the diversity of produce should also be considered by adopting new technology in cultivation.

In general, higher quality VietGAP vegetables in terms of having additional safety characteristics can be sold at higher prices in Hanoi markets. Interestingly, our results are not the same with Yue and Tong (2009) who studied US consumers preferences for fresh produce. And in their conclusions, consumers' WTP did not differentiate among organic attributes and local attributes. Bi et al. (2015) also claimed that US consumers' WTP for sensory attribute was negative for juice labeled as organic and positive for juice labeled as conventional. These conclusions have proved how wide diversity of preferences on consumers for safe foods is and it should be based on the actual situation in each country and each area of study.

## 4. CONCLUSION AND RECOMMENDATION

Using choice experiment method, this study aims to indentify the potential market for VietGAP vegetables based on seeking consumers' preferences and WTP for different attributes of VietGAP vegetables. The results show that Hanoi consumers give highest priority to presence of label on vegetable products, followed by the information of traceability, availability and price. Moreover, the justifiable demand of consumers with regards to guarantee of safe vegetables is the credibility of the agency ensuring it. Organic certification label certified by NGOs has the highest preference and most priority by respondents, followed by the traceability information covering farming, distribution and processing, circulation and marketing, and availability in supermarket systems. Consumers' utility decreases if the price of VietGAP vegetables increases as the result of choosing non-conventional vegetables. Consumers are willing to pay the highest amount of money of 31,370 VND/kg in terms of vegetables including organic certification label certified by NGOs, full traceability information, and selling in the supermarket systems. In the contrast, consumers are willing to pay the lowest amount of money of 21,530 VND/kg in terms of VietGAP vegetables selling in the supermarkets but without label, traceability information covering only farming.

These findings are expected to provide the hard evidence to producers, market actors, and policy makers to make reasonable adjustments such as (1) stakeholders should increase the availability of traceable vegetables with quality certification label to meet diverse needs of consumers; (2) the direct involvement of NGOs in the VietGAP standardized certification process should be encouraged; (3) to increase consumers' trust in VietGAP certification label certified by government agencies, the Vietnamese government should improve the quality of their certification label by requiring extra strict criteria in certification process to make sure that products are satisfied VietGAP standard; (4) the Vietnamese government should provide an adequate traceability system for VietGAP vegetable supply chain through the promotion of horizontal and vertical coordination, and participation of NGOs as well as the representative of Consumer Protection Agency.

## Acknowledgements

## *References*

Ara, S. (2003, August). *Consumer willingness to pay for multiple attributes of organic rice: A case study in the Philippines.* Paper presented at the 25th International Conference of Agricultural Economists, Durban, South Africa. Retrieved from http://www.researchgate.net

Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D.W., Sugden, R., & Swanson, J. (2002). *Economic valuation with stated preference techniques: a manual.* Edward Elgar. Cheltenham, UK. Northampton, MA, USA

Becker, G.S. (1976). *The economic approach to human behavior.* University of Chicago press.

Bi, X., Gao, Z., House, L.A., & Hausmann, D.S. (2015). *Tradeoffs between sensory attributes and organic labels: the case of orange juice.* International Journal of Consumer Studies *39 (2):* 162-171. http://dx.doi.org/10.1111/ijcs.12164

Birol, E., Roy, D., Deffner, K., & Karandikar, B. (2009, August). *Developing country consumers' demand for food safety and quality: Is Mumbai ready for certified and organic fruits?* Paper presented at the Conference, Beijing, China (No. 51689). International Association of Agricultural Economists.

Bonilla, T. (2010). *Analysis of consumer preferences toward 100% fruit juice packages and labels* (Doctoral dissertation, Department of Agricultural Economics and Agribusiness, Universidad de Costa Rica, Costa Rica). Available from Electronic Thesis & Dissertation. Retrieved from http://etd.lsu.edu/docs/available/etd-07032010-194437/

Carlsson, F., Frykblom, P., & Liljenstolpe, C. (2003). *Valuing wetland attributes: an application of choice experiments.* Ecological Economics 47 (1): 95-103. http://dx.doi.org/10.1016/j.ecolecon.2002.09.003

Chau, T.H.B. (2015). *Impact of VietGAP Vegetable Production on the Health of Farmers in Thua Thien Hue Province, Vietnam.* EEPSEA Research Report No. 2015-RR19. WorldFish (ICLARM), Laguna, Philippines. Retrieved from http://www.eepsea.org/pub/rr/2015-RR19_BaoChau.pdf

Chen, M.F. (2007). *Consumer attitudes and purchase intentions in relation to organic foods in Taiwan: Moderating effects of food-related personality traits.* Food Quality and Preference 18 (7): 1008-1021. http://dx.doi.org/10.1016/j.foodqual.2007.04.004

Chung, D.K., & Dung, K.T. (2014). *Impacts of community based training on pesticide risk reduction.* Journal of Science and Development Vol. 12 (No. 1): pp.108-115. Retrieved from www.vnua.edu.vn:85/tc_khktnn/download.asp?ID = 1280

Cicia, G., Del Giudice, T., & Scarpa, R. (2002). *Consumers' perception of quality in organic food: a random utility model under preference heterogeneity and choice correlation from rank-orderings.* British Food Journal 104 (3/4/5): 200-213. http://dx.doi.org/10.1108/00070700210425660

Duong, T. (2012, April 16). *There is a strongly need for VietGAP logo to identify VietGAP products* (Online). Retrieved August 15, 2015, from http://baocongthuong.com.vn/can-logo-de-nhan-biet-san-pham-vietgap.html

FAO. (2014). *Training manual on implementing ASEANGAP in the fruit and vegetable sector: Its certification and accreditation.* Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific, Bangkok. RAP Publication (FAO) eng no. 2014/02. Retrieved from http://www.fao.org/docrep/019/i3576e/i3576e00.htm

Greene, W. (2008). *Econometric analysis (6th edition).* New Jersey: Prentice-Hall.

GSO. (2012). *Result of The Vietnam Household Living Standards Survey 2012*. Statistical Publishing House, Hanoi.

GSO. (2014). *Statistical Yearbook of Vietnam 2014*. Statistical Publishing House, Hanoi

Hai, N.M., Moritaka, M., & Fukuda, S. (2013). *Willingness to Pay for Organic Vegetables in Vietnam: An Empirical in Hanoi capital*. Journal of the Faculty of Agriculture, Kyushu University, 58 (2): pp.449-458. Retrieved from http://www.catalog. lib.kyushu-u.ac.jp/handle/2324/27378/p449.pdf

Hearne, R., & Volcan, M. (2002). *The use of choice experiments to analyze consumer preferences for organic produce in Costa Rica*. In American Agriculture Economics Association (AAEA) Annual Meeting Long Beach, California. Retrieved from http://www. ageconsearch.umn.edu/bitstream/19851/1/sp02he01.pdf

Henson, S. (2003). *The economics of food safety in developing countries*. ESA Working Paper. No. 12, 19(3): pp.19-30. Retrieved from http://www.eldis.org/go/home&id = 24210&type = Document#.V-aacpCg_Qc

Hoang, H., & Nakayasu, A. (2006). *Study on the factors influencing the consumption of safe vegetables in Hochiminh City, Vietnam*. Journal of Applied Sciences 6(9): 1986-1992. http://dx.doi.org/10.3923/jas.2006.1986.1992

Hoi, P.V., Mol, A.P., & Oosterveer, P.J. (2009a). *Market governance for safe food in developing countries: The case of low-pesticide vegetables in Vietnam*. Journal of environmental management 91(2): 380-388. http://dx.doi.org/10.1016/j. jenvman.2009.09.008

Hoi, P.V., Mol, A.P., Oosterveer, P., & Van Den Brink, P.J. (2009b). *Pesticide distribution and use in vegetable production in the Red River Delta of Vietnam*. Renewable Agriculture and Food Systems 24(03): 174 - 185. http://dx.doi.org/10.1016/j. njas.2013.09.003

Huong, N.T. (2012). *Key factors affecting consumer purchase intention: A study of safe vegetabe in Ho Chi Minh city, Vietnam* (Master thesis, Intrnational School of Bussiness, Hochiminh University, Vietnam). Retrieved from http://www.isb.edu.vn/ ISBResearch.aspx?page = 1&p = 5&param = 28

Lancaster, K.J. (1966). *A new approach to consumer theory*. Journal of political economy Vol. 74, No. 2. pp.132-157. The University of Chicago Press. Retrieved from http://www.jstor.org/stable/1828835

Loureiro, M.L., & Umberger, W.J. (2007). *A choice experiment model for beef: What US consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability*. Food policy 32 (4): 496-514. http://dx.doi.org/10.1016/j. foodpol.2006.11.006

Mac, N.C., & Trung, N.L. (2014). *An analysis of information of vegetable origins and sources influence on consumer's behavior in Hanoi city*. Journal of Science and Development Vol. 12 (No. 6): 877-884.

MARD. (2008). *Good agricultural practices for production of fresh fruit and vegetables in Vietnam (VietGAP)*. Retrieved from https:// www.unido.org/fileadmin/user.../VIETGAP-Fruit_and_Vegetables-English.pdf

MARD. (2015, April 1). *Bulding the trust with VietGAP vegetables in Hanoi (Online)*. Retrieved April 1st, 2015, from http:// vietgap.gov.vn/Content.aspx?newsID = 102.

McFadden, D. (1973). *Conditional logit analysis of qualitative choice behavior. Frontiers in Econometrics*. New York: Academic Press. pp. 105-142.

Mergenthaler, M., Weinberger, K., & Qaim, M. (2009, August). *The role of consumers' perceptions in the valuation of food safety and convenience attributes of vegetables in Vietnam*. Paper presented in Conference, Beijing, China. International Association of Agricultural Economists.

Moustier, P., & Figuié, M. (Eds.). (2003). *Food markets and agricultural development in Vietnam*. Markets and Agriculture Linkages for Cities in Asia. Hanoi, MALICA. Retrieved from http://agents.cirad.fr/pjjimg/muriel.figuie@cirad. fr/MoustierP_FoodMarketsAgriculturalDevelopmentVietnam.pdf

Moustier, P., Figuié, M., Loc, N.T.T., & Son, H.T. (2005, July). *The role of coordination in the safe and organic vegetable chains supplying Hanoi.* Paper presented at the 1st International Symposium on Improving the Performance of Supply Chains in the Transitional Economies, Chiang Mai, Thailand. *Acta Horticulturae (699):* 297-306. Louvain, BEL : ISHS. Retrieved from http://prodinra.inra.fr/record/25478

Nabeshima, K., Michida, E., Vu, H.N., & Suzuki, A. (2015). *Emergence of Asian GAPs and its relationship to global GAP.* Retrieved from http://www.ide.go.jp/English/Publish/Download/Dp/507.html

Nicetic, O., Van De Fliert, E., Chien, H.V., Mai, V., & Cuong, L. (2010). *Good Agricultural Practice (GAP) as a vehicle for transformation to sustainable citrus production in the Mekong Delta of Vietnam: Proceedings of the 9th European IFSA Symposium on Building sustainable rural futures: the added value of systems approaches in times of change and uncertainty* (pp.1893-1901). Vienna, Austria. Retrieved from http://ifsa.boku.ac.at/cms/fileadmin/Proceeding2010/2010_WS4.4_Nicetic.pdf

Oanh, N.K. (2005). *Information on chemical safety and environmental protection: a testing model applicable for safely pesticide management in Vietnam.* Paper presented at Vietnam National Conference on Environmental Protection, Hanoi, Vietnam (Vol. 21).

OECD. (2008). Environmental performance of agriculture in OECD countries since 1990. *OECD Publishing, Paris.* http://dx.doi.org/10.1787/9789264040854-en

Onozaka, Y., Bunch, D., & Larson, D. (2006). *What exactly are they paying for? Explaining the Price Premium for Organic Fresh Produce.* Agricultural and Resource Economics Update, 9 (6): pp.1-4. University of California Giannini Foundation of Agricultural Economics. Retrieved from http://giannini.ucop.edu/publications/are-update/issues/2006/9/6/what-exactly-are-they-pay/

Ortega, D.L., Wang, H.H., Wu, L., & Olynk, N.J. (2011). *Modeling heterogeneity in consumer preferences for select food safety attributes in China.* Food Policy 36 (2): 318-324. http://dx.doi.org/10.1016/j.foodpol.2010.11.030

Probst, L., Houedjofonon, E., Ayerakwa, H.M., & Haas, R. (2012). *Will they buy it? The potential for marketing organic vegetables in the food vending sector to strengthen vegetable safety: A choice experiment study in three West African cities.* Food Policy 37 (3): 296-308. http://dx.doi.org/10.1016/j.foodpol.2012.02.014

Rattiya, S.L. (2010). *Determinants of consumer preferences towards and willingness to pay for safety fresh fruits and vegetables in Bangkok and Chiangmai urban areas* (Doctoral dissertation). Faculty of Economics, Kasetsart University, Bangkok, Thailand. Retrieved from http://lib.ku.ac.th

Sarter, S., Ha, H.P., & Anh, T.K. (2012, June). *Current situation of food safety in Vietnam* [PowerPoint slides]. In the 1st FOODSEG Symposium, Berlin, Germany. Retrieved from http://foodseg.linux15.webhome.at/fileadmin/userdaten/pres_symp_I/presentations_pdf/vietnam.pdf

Simmons, L., & Scott, S. (2011, February 08). *Health concerns drive safe vegetable production in Vietnam.* LEISA-LEUSDEN-Magazine 23 (3): pp.22

Sporleder, E.M., Kayser, M., Friedrich, N., & Theuvsen, L. (2014). *Consumer preferences for sustainably produced bananas: a discrete choice experiment.* International Food and Agribusiness Management Review, 17(1), pp.59-82. IFAMA. Retrieved from http://purl.umn.edu/163354

Sriwaranun, Y. (2011). *An Empirical analysis of consumers purchasing behavior towards organic products in Thailand* (Doctoral dissertation, Lincoln University). Retrieved from http://hdl.handle.net/10182/4059

Thuan, N.T., Nhuan, H.N., Vy, L.T.L., Ha, D.N. & Thanh, N.T. (2010). *The economic solution for organize implementation the Vietnamese Good Agricultural Practice in winter vegetables in suburban of Red River Delta.* Ministry of Education and Training, Vietnam

Train, K.E. (2003). *Discrete choice methods with simulation* (Vol. 8). Cambridge: Cambridge University Press.

Wang, H., Moustier, P., & Loc, N.T.T. (2014). *Economic impact of direct marketing and contracts: The case of safe vegetable chains in Northern Vietnam.* Food Policy, 47, pp.13-23. http://dx.doi.org/10.1016/j.foodpol.2014.04.001
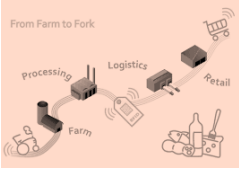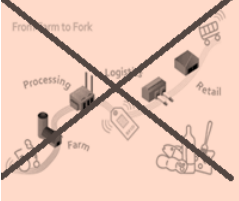
World Bank. (2006). *Vietnam food safety and agricultural health action plan.* Report No. 35231 VN. East Asia & Pacific Region and Agriculture & Rural Development Department. Washington, DC: World Bank. Retrieved from http://documents. worldbank.org/curated/en/398891468124788088/Vietnam-Food-safety-and-agricultural-health-action-plan

Wu, L., Wang, S., Zhu, D., Hu, W., & Wang, H. (2015). *Chinese consumers' preferences and willingness to pay for traceable food quality and safety attributes: The case of pork.* China Economic Review, 35, pp.121-136. http://dx.doi.org/10.1016/j. chieco.2015.07.001

Yue, C., & Tong, C. (2009). *Organic or local? Investigating consumer preference for fresh produce using a choice experiment with real economic incentives.* HortScience, 44(2), pp.366-371. Retrieved from http://hortsci.ashspublications.org/content/44/2/366. short

## *Appendix A*

**Table A1**
**An example of a choice set**

| | *Availability* | *Quality certification label* | *Traceability information* | *Price* | *I would choose* |
|---|---|---|---|---|---|
| A | Vegetables are sold in fresh market  | Organic label is certified by NGOs  | Traceability information covering farming, distribution and processing, circulation and marketing  | 22 000 VND/kg | ☐ |
| B | Vegetables are sold in safe vegetable store  | VietGAP label is certified by Government  | Traceability information covering farming  | 17 000 VND/kg | ☐ |
| C *(status quo)* | Vegetables are sold in fresh market  | Vegetables without quality certification label  | No traceability information  | 10 000 VND/kg | ☐ |