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FRESH PRODUCE SAFETY AND GOOD AGRICULTURAL PRACTICES: STAKEHOLDERS' PERCEPTION AND CONSUMERS' CHOICE IN THAILAND

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ABSTRACT

Concerns of Thai consumers on food safety have been recently increasing, especially in urban areas and for fresh produce because food safety scandals, such as chemical residues on fresh produce (e.g., cabbage) still frequently occur. The Thai government tried to meet consumer needs by imposing in the domestic market a stronger regulation aimed at increasing the baseline level of food safety assurance and by introducing a voluntary standard (based on Good Agricultural Practices or GAPs and known as Q-GAP) and the related food safety label (i.e., Q mark). However, since standards and regulations are weakly implemented in the domestic market compared to exported products, there is still a lack of Thai consumers' confidence in the safety of local food products. In this work the current situation of GAPs adoption in Thai fresh produce production is analysed. Furthermore, it is studied whether Thai consumers place value on food safety labels available on the market, to know whether consumer demand could drive the market of certified safer products. This study contains three essays: 1) a review of the literature, 2) a qualitative study on stakeholders' perception toward GAPs adoption and 3) a quantitative study, aimed at analysing consumers' preferences and willingness-to-pay for food safety labels on fresh produce using a discrete choice experiment. This dissertation contributes to the economics of quality assurance and labelling, specifically addressing GAPs and food safety label in the fresh produce supply chain. Results show that Q-GAP could be effectively used to improve food safety in Thai domestic market, but its credibility should be improved. Stakeholder's awareness toward food safety issues and the delivery of reliable and sound information are crucial. Thai consumers are willing to pay a premium price for food safety labelled produce over unlabelled ones. Implications for both government and business decision-makers are discussed.

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EXECUTIVE SUMMARY

Thailand has been awakened in the highly competitive food market in the 21st century among strong competitors. Previously, Thailand enjoyed its share in the global market as one of main producers of rice and tropical fruits and vegetables. However, in the last decades, it has been struggling in the competition with several competitors, for instance, Vietnam, Laos, Malaysia, and other emerging countries. As it wants to maintain its capacity to compete in the market it must focus on food quality and safety because they are main issues and concerns in the global market . Nevertheless, its attempts proven to be inadequate since several Thai food products, particularly fresh vegetables are still banned by the developed market, e.g. European Union (EU) market. In 2011, the EU temporarily banned Thai vegetable exports due to its concerns over the implementation of food safety control, especially contaminated produce. Although later the ban was lift off but Thai fresh produce exporters received a warning notice that the EU would ban the import of Thai products if further insects or contamination were found on produce more than five times over a year.

Thai fresh produce exporters and producers related to exporting cope with this issue by adopting food safety assurance system (FSAS) and standards, such as, GLOBALGAP (Good Agricultural Practices), GMP (Good Manufacturing Practice) and HACCP (Hazard Analysis and Critical Control Points). On the other hand, the regulations and standards in the domestic market is weakly implemented and enforced, results in high discrepancy between regulations and standards applied for export and domestic products (Oates, 2006; Takeuchi and Boonprab, 2006). This leaves a big question to the importers and also Thai consumers whether Thai food products are trustworthiness in term of food safety. In general, developed countries (which are main importers of Thai products) tend to adapt stringent FSAS and standards in domestic markets; hence, they create country image as a safe food producer before focusing on exporting to the international market. Whilst in Thailand, likes other developing countries, the situation is in the contrary way. First, the external pressure (i.e., importers) pushes exporters to adopt strict FSAS and food safety standards by imposing them as *de facto* mandatory standard for entry into the international market, then, it spills over to the domestic market. This means the first sector who would apply FSAS and standards is export sector and later (not always) the domestic supply chain will develop similar practices, although usually less stringent. As we could see that food safety scandals still remain a prominent issue in Thai domestic markets, for instance, scandals related to chemical residues on some fresh produce (e.g. Chinese Kale and chilli), or outbreak of *Clostridium botulinum* contamination in home-canned bamboos shoots. This results in a low level of trust and lack of confidence of Thai consumers in the safety of local food products in the domestic market (Supaphol, 2010). Thus, Thai consumers have increased awareness on the importance of food safety controls and some of them are now more demanding when it deals with quality and safety of food products, especially in the urban area (e.g. Gorton *et al.*, 2011; Lippe, 2010; Lippe *et al.*, 2010; Posri *et al.*, 2006; Roitner-Schobesberger *et al.*, 2008; Takeuchi and Boonprab, 2006).

In order to meet consumer demand and to increase the level of food safety assurance provided by the market, Thai government tries to strengthen the regulation in the domestic market and to

introduce a voluntary standard and the related food safety label in the market. In 2004, the Thai government enacted a food safety policy, "From-Farm-To-Table" or "From-Farm To-Forks" (ACFS, 2011b). Several strategies and tools have been undertaken to monitor and control food safety throughout the food supply chain. For instance, establishing mandatory regulations on the limited level of residue and contamination in food products and promoting national "Good Agricultural Practice (GAP)" policy or "Q-GAP" as a voluntary standard to reduce the use of agrochemicals. Subsequently, in 2005, Food Safety label (i.e., Q mark from the Ministry of Agriculture and Cooperative) have been introduced to the market in order to assist consumers to recognize safe products, particularly fresh produce that is the main concern of Thai consumers. Their ultimate goals are to keep high standard food in the domestic market and to meet the international food quality and safety standard level. As a results, the number of food poisoning cases in Thailand has been stable over the last ten years. Nevertheless, Thai Health Promotion Foundation announced that Thai population have higher risk to uptake food products that may cause food poisoning during last 20 years (Thai Health Promotion Foundation, 2010).

In order to design and implement appropriate food safety management strategies, it is important to understand the situation of current food safety regulations, standards and the FSAS adoption in Thai food supply chain. Furthermore, it is necessary to get information regarding perceptions of the stakeholders in the supply chain to understand the strength and bottom neck of the FSAS implementation and to involve them into the system as much as possible. The question to be addressed here are: What is the current situation of FSAS adoption in Thai fresh produce supply chain? What are the opportunities and hindrance to adopt FSAS? Is information about food safety assurance valid for consumers? What are the benefits of food safety confidence for Thailand? All in all, should the Thai government implement stricter food safety assurance as mandatory regulations? This research is an attempt to answer to these questions focusing on the adoption of GAPs in the supply chain of Thai fresh produce.

To the best of researcher's knowledge, there is no published study regarding this topic in depth in Thailand. Therefore, this research aims at filling this gap by focusing on GAPs adoption in the fresh produce production. The reason is that among food products, chemical residual level in fresh vegetables are the main concern since Thai traditional cuisine is mainly based on fresh vegetables (Lippe, 2010; Vanit-Anunchai, 2006; Vanit-Anunchai and Schmidt, 2006). Whilst GAP standard is the most basic voluntary standards adopted in Thailand and the government has been trying to push Thai producers to apply GAPs concept as a first step to provide safer fresh produce. This research presents three essays: 1) a review; 2) a qualitative research on stakeholders' perception toward GAPs adoption in Thai fresh produce production; and 3) an empirical research, analysing consumers' preferences and willingness-to-pay for food safety label on fresh produce. The first essay describes and analyses the current situation of GAP standards implemented in fresh produce production in Thailand. The second essay addresses difficulties and barriers of GAP adoption in the Thai fresh produce industry from stakeholders' perceptions. The third essay analyses Thai consumers' preferences and willingness-to-pay (WTP) of food safety labels for fresh produce. The overall aim of the study is twofold. First is to describe the current situation of GAPs adoption in the Thai fresh produce industry both from previous research and from stakeholders' point of view. The second is to estimate the value Thai

consumers place on food safety labels for fresh produce. The ultimate purpose is to use information gained from this dissertation to provide useful information for policy makers on food safety standards and label policy and to provide guidance to future management and marketing strategies for the Thai fresh produce industry.

The first essay is a review aimed at describing and analysing the current situation of GAP standards implemented in fresh produce production in Thailand. I adopted a mixed explorative and descriptive approach by reviewing the literature and using multidimensional scaling (MDS) to draw a subjective perceptual map of the relative position of the set of GAP standards adopted in Thailand. Currently there are three main voluntary GAP standards adopted in Thailand - National GAP or Q-GAP, ThaiGAP and GLOBALGAP. While GLOBALGAP is a private internationally recognised standard, Q-GAP and ThaiGAP are local standards, which have been developed by the government and private sectors, respectively. The perceptual map shows that GLOBALGAP is the benchmark for other GAP standards, both on trustworthiness and business usefulness aspects. While ThaiGAP is perceived as possessing a higher trustworthiness than Q-GAP, Q-GAP confers a higher business advantages because it has been recognised on the domestic and regional market. In order to improve trustworthiness, Q-GAP standard regulation should be strictly enforced, the inspection should be done by third parties and an efficient traceability system need to be implemented. Whereas, promotion and marketing activity should be applied for ThaiGAP in order to improve its recognition in the market. Note that the result from the perception map is subjective to the researcher's perception, results should be interpreted carefully. The stakeholders' perceptions towards the positioning of GAPs standards should be investigated in further research.

Considering the current situation of GAP implementation in the Thai domestic market, the implementation is considerably weak. Apart from the voluntary standards discussed so far, there is not a comprehensive mandatory standard according to Thai law. Currently, the Thai domestic market does not provide enough market incentives for adoption (e.g. premium price or increase the possibility to entry the market or enhance the competitiveness of the supplier). Hence, most of producers do not perceive the advantages of adopting GAP. In conclusion, the problem for implementing FSAS and GAP in Thailand is rooted in the lack of knowledge and understanding of principles, and the perception of advantages (especially the internal ones) that FSAS adoption and implementation may confer among stakeholders. Therefore, a possible solution could include creating awareness about food safety and GAP among stakeholders, including the domestic consumer sector, and involving players on the system. Q-GAP is the most widely adopted standard and is the only one allowing to access the Thai mass market; however, improvement of the standard credibility is urgently required.

The second essay addresses difficulties and barriers of GAP adoption in the Thai fresh produce industry from stakeholders' perceptions. Forty-eight qualitative semi-structured interviews were held in Bangkok and nearby cities. The key informants were experts, the governmental authorities, producers, distributors, exporters and consumers. Data was analysed by qualitative content analysis. The main findings suggest the stakeholders agree that GAPs is useful and could be used as a tool to control and monitor food safety in the supply chain. However, they perceived

low credibility of national GAP or Q-GAP standards implementing in Thai domestic markets due to the lack of verification and traceability system; also the system is carried out by the governmental authorities.

The perceived usefulness of GAPs and Q-GAP and/or food safety label of each tiers:

- Producers - GAPs is a complicated system so they have to take time to learn. The main difficulty for them is to keeping records. However, whether they will adopt GAPs or not depends on business partners‘ requirement. GAPs is 'the must' for producers connecting with exporters whist GAP adoption of producers for domestic markets depends on their distribution channels. Healthy shops and modern trades (e.g. supermarket, hypermarket) are the main distribution channels of the food safety certified products, so, producers connecting to them will adopt GAPs. On the other hand, producers selling product to retailers at fresh markets are not interested in GAP adoption. To producers, GAPs may facilitate market access rather than commanding a premium price.
- Distributors - GAPs and other food safety certifications and labels are marketing tools (if there is consumer demand). Different actors perceived usefulness of GAPs and food safety label differently:1) collectors do not concern about it so much because they have high market power in the Thai traditional supply chain; 2) wholesalers started to be interested in GAPs and Q mark label as they might want to supply modern trades; 3) retailers maybe interested depending on targeted customers (modern trade shows their interest in food safety standards and label whilst small retailer at fresh market are not interest at all); and 4) exporters think that it is very important, especially to export to the EU market.
- Consumers - food safety certification and labels is important to guarantee food safety; however, they do not fully trust them due to past experience and lack of knowledge, information and understanding. They rely mainly on shop’s brand ('Royal Project', ‘Lemon Farm‘) or relationships with sellers than certification logo. To consumers, ‘Physical appearance’ strongly related to ‘food safety’, thus they look for natural defects. Regarding products with Q mark label, some consumers perceive Q mark as a guarantee of food safety at the basic level but do not fully rely on it, some do not concern about Q mark and the certification at all because of a lack of trust or perceive them as a marketing tool.

Nevertheless, we found that factors affecting the consumers purchasing decision are price, freshness, appearance, quality (e.g. taste, sweetness, size, etc.), relations with sellers and service, seasonal produce, origin of products, shelf-life, package, convenience and food safety.

Finally, the results suggest that consumer demand will drive the market of food safety certified products whilst exporters and modern traders are main influencers on producer’s adoption of GAPs. Nevertheless, the creation of stakeholder’s awareness toward food safety issues and information provision are still crucial.

The third essay analyses Thai consumers' preferences and willingness-to-pay (WTP) of food safety labels for fresh produce using a discrete choice experiment approach. The attributes freshness, price, and brand & label were selected based on the results obtained from previous consumer research studies regarding the attributes preferred by consumers and their WTP for

these attributes. 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 concerned 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 Claimed Safe Produce ("ผักปลอดสารพิษ"), it is only a 'claim' that the product is safe without the guarantee or inspection from government authorities or third parties) and private brands i.e. Royal Project ("โครงการหลวง") and Doctor's Vegetables ("ผักด็อกเตอร์") are included in this study due to their existence and importance as brand and label related to food safety in the market. Note that most of the products from these private brands obtained Q mark; thus, in order to make the simulated shopping situation credible, Q mark always appeared together with the private brands in this experiment. A sample of 350 Thai consumers were surveyed in Bangkok in July 2013. Multinomial Logistic Regression (MNL) and mixed logit (RPL) model were used to analyse the data.

Results suggest that 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 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. This finding implies that when providing such information (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 *et al.*, 2005).

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. The high premium prices (110% to 180% compared to regular market prices) in this study indicate the strong perceived need to have safer food available on the market and social desirability to be informed by food safety label. The results also shows 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, the general consumers are willing to pay more or less the same for any combination of guaranteed brands and labels proposed (except the claimed label). This could imply that, perhaps, the type of brand & label does not matter, they prefer just to have 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. However, we cannot safely draw this conclusion because the experimental design does not allow us to segregate between the effect of brand and labels. 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 RPL model, which allows preference heterogeneity among consumers, better fits the data than MNL model, and standard deviations of brand and labelled attributes are statistically significant, thus suggesting that heterogeneity is an important issue to take into account. Hence, probably there are market segments preferring different food safety guarantees. 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.

This dissertation contributes to the economics of quality assurance and labelling, specifically addressing GAPs and food safety label in fresh produce supply chains. The findings have important implications for public policy and firm strategic decision making. It shows that Q-GAP could be effectively used to improve food safety in Thai domestic market, but that its credibility should be improved. GAP scheme and food safety label policy should be supported to reach food safety targets and to provide consumers with information and protection from deception. The creation of stakeholder's awareness toward food safety issues and the delivery of reliable and sound information are crucial. Thai consumers are willing to pay a premium price for food safety labelled produce, therefore the label is beneficial for Thai consumers since it could reduce the asymmetry of information between them and producers. Results suggest to producers and marketers that there is a perceived need for a higher level of food safety in the fresh produce supply chain. Hence, there is a potential market share for fresh produce products bearing food safety labels so that they 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. Finally food safety labels can be used as an incentive to promote safe production/consumption in accordance to the global trends.

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CHAPTER 1

INTRODUCTION

Recently, Thai fresh produce industry faces many challenges in the international market, for instance, low-price products from competitors, high production and logistic costs, quality issues, and food safety issues. The last issue is getting more and more serious as import partners, particularly in developed countries, use food safety standard as a prerequisite standard to enter to the market. In 2009, the EU had announced the list of five groups of vegetables (*Ocimum*, *Capsicum*, *Solanum Melongena*, *Momordica charantia*, and *Eryngium Foetidum*) from Thailand that had been temporary banned and later has changed to be strictly controlled and tested before distribution in the EU, result in the loss of income and the dilution of country image (Pornsiripratan, 2011). Therefore, the Thai fresh produce industry now adjusts itself to be stricter in food safety control by implementing quality and safety management schemes.

Food safety is not only important issue in export markets but also the main concern in Thai domestic market. Thai consumers have recently increased their concern on food safety due to a series of incidents of pathogenic microbial and chemical contamination in the food chain and felt uncertain on the safety issues of some advanced food technologies using in food industry e.g. genetic modification food, genetic engineering products, and food irradiation (Supaphol, 2010). Foodborne illness such as diarrhoea that take place annually and other food scared such as bird flu that occur occasionally cause not only medical treatment cost but also the reduction of social welfare as it reduced labour in labour market and domestic production as a whole. The Ministry of Public Health reported that 103,420 Thai persons were ill from food poisoning with Morbidity rate 162.98/100,000 population in 2009 (Bureau of Epidemiology, 2009). Although the number of food poisoning cases in Thailand has been stable over last ten years, Thai Health Promotion Foundation announced that Thai populations have higher risk to uptake food products that may cause food poisoning during last 20 years (Thai Health Promotion Foundation, 2010). Department of Medical Science inspected food products in the markets and found some cases of pathogenic microorganisms, agricultural chemical, and heavy metal contaminations. They mentioned that the main causes are the soft enforcement of food safety regulations and the increasing of imported food which have not been strictly regulated for food safety and quality standard. The main lists of these products are fruits and vegetables (both fresh and dried products), fishery products, snacks and tainted milk (Thai Health Promotion Foundation, 2010).

This situation, coherent with food scares from imported products, make Thai consumers increase their awareness on safety of food they consumed (e.g. Posri *et al.*, 2006; Roitner-Schobesberger *et al.*, 2008; Lippe *et al.*, 2010) and some are looking for information and certification or sign to guarantee food safety, especially in fresh fruits and vegetable products (Lippe, 2010; Vanit, 2006). This contributes to the fact that (1) fresh fruits and vegetables are mainly consumed in traditional cuisine; (2) these products are usually intensively cultivated with agricultural chemical products; and (3) it characteristics such as perishable and short shelf-life makes more difficult for post-harvest management, storage, and transportation without using chemical products.

This situation stimulates the public attention to force the Thai government and private sectors to be in charge of food safety issues and set up the stricter food safety regulation and management system in order to improve Thai consumers' confidence on safety level of food and to ensure that Thai consumers will have lower risk to uptake unsafe food. In 2004, the Thai government enacted a food safety policy, "From-Farm-To-Table" or "From-Farm To-Forks" (ACFS, 2011b). Several strategies and tools have been undertaken to monitor and control food safety throughout the food supply chain. For instance, establishing mandatory regulations on the limited level of residue and contamination in food products and promoting national "Good Agricultural Practice (GAP)" policy or "Q-GAP" as a voluntary standard to reduce the use of agrochemicals. Subsequently, in 2005, Food Safety label (i.e., Q mark from the Ministry of Agriculture and Cooperative) have been introduced to the market in order to assist consumers to recognize safe products, particularly fresh produce that is the main concern of Thai consumers. Their ultimate goals are to maintain high standard food in the domestic market and to meet the international food quality and safety standard level.

One of the key challenge for the policy makers to decide to announce and implement any policy, is to balance alternative demands from different tiers in the supply chain including consumers, food manufacturers, food retailers and farmers (Henson and Caswell, 1999). Therefore, consumer demand and perception of different tiers in supply chain toward GAPs implementation, including potentials and barriers of GAPs development should be recognized in order to provide relevant information for policy makers to decide on how could they improve the effectiveness of the implementation. The question to be addressed here are: What is the current situation of FSAS adoption in Thai fresh produce supply chain? What are the opportunities and hindrance to adopt FSAS? Is information about food safety assurance valid for consumers? What are the benefits of food safety confidence for Thailand? All in all, should the Thai government implement stricter food safety assurance as mandatory regulations? This research is an attempt to answer to these questions focusing on the adoption of GAPs in the supply chain of Thai fresh produce.

To the best of researcher's knowledge, there is no published study analysing this topic in depth in Thailand. Therefore, this research aims at filling this gap by focusing on GAPs adoption in the fresh produce production. The reason is that among food products, chemical residual level in fresh vegetables are the main concern since Thai traditional cuisine is mainly based on fresh vegetables (Lippe, 2010; Vanit-Anunchai, 2006; Vanit-Anunchai and Schmidt, 2006). Whilst GAP standard is the most basic voluntary standards adopted in Thailand and the government has been trying to push Thai producers to apply GAPs concept as a first step to provide safer fresh produce.

1.1 Outline of the Thesis

This research composes of three essays: 1) a review; 2) a qualitative research on stakeholders' perception toward GAPs adoption in Thai fresh produce production; and 3) an empirical research, analysing consumers' preferences and willingness-to-pay for food safety label on fresh produce. The first essay describes and analyses the current situation of GAP standards implemented in fresh produce production in Thailand. The second essay addresses difficulties and barriers of GAP adoption in the Thai fresh produce industry from stakeholders' perceptions. The third essay analyses Thai consumers' preferences and willingness-to-pay (WTP) of food safety labels for fresh produce.

The first essay is a review aimed at describing and analysing the current situation of GAP standards implemented in fresh produce production in Thailand. I adopted a mixed explorative and descriptive approach by reviewing the literature and using multidimensional scaling (MDS) to draw a subjective perceptual map of the relative position of the set of GAP standards adopted in Thailand. Currently there are three main voluntary GAP standards adopted in Thailand - National GAP or Q-GAP, ThaiGAP and GLOBALGAP.

The second essay addresses difficulties and barriers of GAP adoption in the Thai fresh produce industry from stakeholders' perceptions. Forty-eight qualitative semi-structured interviews were held in Bangkok and nearby cities. The key informants were experts, the governmental authorities, producers, distributors, exporters and consumers. Data was analysed by qualitative content analysis.

The third essay analyses Thai consumers' preferences and willingness-to-pay (WTP) of food safety labels for fresh produce using a discrete choice experiment approach. The attributes freshness, price, and brand & label were selected based on the results obtained from previous consumer research studies regarding the attributes preferred by consumers and their WTP for these attributes. 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 Claimed Safe Produce ("ผักปลอดสารพิษ", It is only a 'claim' that the product is safe without the guarantee or inspection from government authorities or third parties) and private brands i.e. Royal Project ("โครงการหลวง") and Doctor's Vegetables ("ผักด็อกเตอร์") are included in this study due to their existence and importance as brand and label related to food safety in the market. Note that most of the products from these private brands obtained Q mark; thus, in order to make the simulated shopping situation credible, Q mark always appeared together with the private brands in this experiment. A sample of 350 Thai consumers were surveyed in Bangkok in July 2013. Multinomial Logistic Regression (MNL) and mixed logit (RPL) model were used to analyse the data.

1.2 Aims of the Thesis

The overall aim of the thesis is twofold:

1) To describe the current situation of GAPs adoption in the Thai fresh produce industry both from previous research and from stakeholders' point of view.
2) To estimate the value Thai consumers place on food safety labels for fresh produce.

The ultimate purpose is to use information gained from this dissertation to provide useful information for policy makers on food safety standards and label policy and to guide future management and marketing strategies for the Thai fresh produce industry.

CHAPTER 2

FOOD SAFETY ASSURANCE SYSTEM FOR FRESH PRODUCE PRODUCTION IN THAILAND: A REVIEW[1]

Abstract

In 2004, the Thai government enacted a food safety policy, 'From-Farm-To-Table', to ensure food safety throughout the food chain. Several food safety assurance systems (FSAS) such as Good Agricultural Practices (GAP) are employed to control and monitor food safety. Nevertheless, a lack of confidence in food safety of products in the domestic market still exists. This study aimed to describe and analyse the current situation of GAP standards implemented in fresh produce production in Thailand. A mixed explorative and descriptive approach was used by reviewing literature and using multidimensional scaling (MDS) to draw a subjective perceptual map of the relative position of the set of GAP standards adopted in Thailand. Food safety law and regulations were discussed with a comparative analysis of the three kinds of GAP standards applied in Thailand. The subjective perceptual map of the different GAP standards shows that the standards may be positioned with reference to two dimensions: 'trustworthiness' and 'usefulness for the business'. The problem of GAP implementation in Thailand is rooted in a lack of knowledge and understanding of principles and the perception of advantages of GAP adoption among stakeholders. Q-GAP is the most widely adopted standard; however, improvement of credibility of this standard is urgently required.

Keywords: Good Agricultural Practices, standards, perceptual map

2.1 Introduction

Food safety has gained high public attention over the last decade because of a series of food scandals such as several outbreaks of *Escherichia coli* contamination in fresh produce, such as fresh spinach in the US in 2006 (Grant *et al.*, 2008) and bean sprouts in Germany in 2011 (Goetz, 2011). The lack of adequate food safety does not only result in high costs for the industry, but it also has significant impact on social welfare. Therefore, many governments and private organisations have been trying to set up and implement several schemes and programs to strengthen food safety systems. Since 2004, the Thai 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 and subsequently announced national strategic plan entitled 'Standard, Quality and Safety for Agricultural Commodities and Food Products' to be implemented during the period 2010-2013 [The National Bureau of Agricultural Commodities and Food Standard (ACFS, 2011b)]. Several actions have been undertaken to achieve the policy strategic objectives, for example the draw up of mandatory regulations such as MRL (Minimum Residue Level) based on the Codex Alimentarius and Safety Requirements for Agricultural Commodities and Food Products,

[1] This chapter is based on: Rungsaran Wongprawmas, Maurizio Canavari, Chutima Waisarayutt (in press) Food Safety Assurance System for Fresh Produce Production in Thailand: A Review. *Quality Assurance and Safety of Crops & Foods 6*: QAS-01-2013-0255. DOI: 10.3920/QAS2013.0255.

and the promotion of a national 'Good Agricultural Practice (GAP)' policy to reduce agrochemicals use. Furthermore, there are many attempts to set up Food Safety Assurance Systems (FSAS) as they are considered an efficient tool to manage, monitor and control the quality and safety of food production (e.g. Caswell, 1998; Golan *et al.*, 2004; Hammoudi *et al.*, 2010; Henson and Humphrey, 2009; Loureiro and Umberger, 2007). Currently, many public and private agencies have initiated various voluntary certification schemes as a mechanism to establish effective food quality and safety management systems in food production, processing, preservation and distribution (Arpanutud *et al.*, 2009) with the aim to help the adopters not only to comply with regulations, but also to go beyond the mandatory level of food safety and to better meet customer's requirements. Three main voluntary food safety assurance schemes focused on farming are currently available in Thailand: (1) GLOBALGAP which is a private standard and currently adopted predominantly by farms oriented to the EU export market; (2) ThaiGAP that is a private standard mainly adopted by farms focused on exports towards other foreign markets; and (3) national GAP (Q-GAP) that is a national public standard designed to be applied to products sold in domestic and Asian markets.

However, it is worth noting that there are high discrepancy between FSAS and GAP regulations, and enforcement between the production of fresh produce for domestic and export markets. In domestic markets, most of the current standards and regulations are poorly implemented while exported products are more strictly controlled to comply with importer requirements (Oates, 2006; Takeuchi and Boonprab, 2006). This discrepancy between the enforcement of the schemes results in a low level of trust and lack of confidence of Thai consumers in the safety of local food products in the domestic market (Supaphol, 2010).

Consequently, the present situation of FSAS adoption in Thai fresh produce production for both domestic and export markets needs to be analysed. The purpose of this study is to review the literature to address the following questions: What is the present situation of food safety assurance systems adopted in Thai crop production? What are the similarities and differences among different schemes? What constraints to implementing these schemes? Finally, what are the development trends of the schemes implemented in Thailand?

These questions were approached with a focus on fresh produce production[2] as Thai traditional cuisine is mainly based on fresh fruits and vegetables. Consequently, contamination in fresh produce is among the principal concerns for consumers (Lippe, 2010; Vanit-Anunchai, 2006). The three GAPs schemes were compared in order to provide a description of the current situation and to possibly provide suggestions on how to improve the overall performance of the food safety assurance system in Thailand.

2.2 Methodology

This research is focused on the need to improve the understanding of the status and perspectives of food safety assurance systems adoption in the Thai fresh produce industry. The research methodology applied is based on the analysis and summarisation of secondary data, aimed at drawing a description of the past and current situation and at identifying possible trends in the

[2] No specific production was discussed in this study.

future development of fresh produce production in Thailand. Given the limited availability of quantitative data about this topic, a mixed explorative and descriptive approach was adopted.

Secondary data was collected through three different sources: (1) Scientific literature databases during 1995-2012 (e.g. Science Direct, SAGE Journals Online, Kasetsart Journal, etc.) using the following keywords 'food safety' 'assurance system' 'Quality Management System' 'Good Agricultural Practice' and 'fresh produce'; (2) Reports, which are available from national (e.g. Department of Agriculture - DOA, National Bureau of Agricultural Commodity and Food Standards, Ministry of Public Health, etc.) and international organisations (e.g. FAO, Food & Fertilizer Technology Center, The United Nations Conference on Trade and Development); and (3) others (e.g. magazines, press articles and internet) to obtain background information on this topic. Statistical data was collected mainly from sources such as GAP DOA online and Thai official reports.

Based on the review of the previous literature, the authors' subjective perceived relative position of the set of GAP standards adopted in Thailand is presented, drawing a perceptual map by using multidimensional scaling (MDS). A decompositional approach to MDS is utilised, as it enables the of use an overall perceived similarity measures and the identification of the main underlying perceptual dimensions determining the positions of the objects in this multidimensional space (Hair *et al.*, 2010).

The aim of MDS is to transform the researcher's judgment of overall similarity of the GAP standards into multidimensional space. The procedure is as follow. Firstly, a set of 21 unique pairs of the 7 variations of GAP standards (GLOBALGAP option 1; GLOBALGAP option 2; ThaiGAP Level 1 option 1; ThaiGAP Level 1 option 2; ThaiGAP Level 2 option 1; ThaiGAP Level 2 option 2; Q-GAP) was created. Then, the researcher rated the overall pattern of similarities among the pairs of standards on a 9-point scale, with 1 being 'not at all similar' and 9 'very similar'. The matrix of the similarity ranks was created by the *mdsmat* model contained in the Stata 11.0 software package. The *mdsmat* model performed multidimensional scaling for Euclidean proximity data (from the matrix) with an explicit measure of similarity among standards. Subsequently, a perceptual map was created by disaggregate analysis to estimate the relative position of each standard. The dimensionality of the perceptual map was selected by looking at the Kruskal's stress measure (Kruskal and Wish, 1978) and an overall index of fit (R^2) (Hair *et al.*, 2010). In the final step, the dimensional space of the axes was identified and interpreted in terms of standard attributes. It should be noted that this perceptual map only represents the author's subjective perceptions of the different GAP standards; therefore the maps should be considered a tools to better describe and summarize the researcher's point of view.

2.3 Results and Discussion

2.3.1 Laws and regulations regarding to food safety in Thai fresh produce industry

Safety of fresh produce in Thailand is regulated by 5 Ministries: Ministry of Agriculture and Cooperatives, Ministry of Public Health of Thailand, Ministry of Industry, Ministry of Commerce of Thailand and the Ministry of Natural Resources and Environment. More than 15 laws and regulations contribute to the food safety regulatory framework from production, process, import/export and distribution to final consumers (Table 2.1) (ACFS, 2011b). Among them, Agricultural Standards Act B.E. 2551 (2008) is the main act and the most relevant to food safety of fresh produce production. Several standards have been developed under this act, both mandatory and voluntary.

According to the divergence of enforcement in food standards, Thai's food safety assurance systems can be divided into 2 types: (1) mandatory standards, enforced by government agencies throughout Thailand in a mandatory way, aimed to satisfy the public's demand for food safety; and (2) voluntary standards, implemented by producers and firms in a voluntary way, with the objective to satisfy consumers' demand for higher quality and safety, and maintaining a competitively on the international market.

Mandatory standards

All operators involved in the food supply networks have to comply with mandatory standards but the extent to which compliance occurs depends on the level of law enforcement. The Food and Drug Administration (FDA) of the Ministry of Public Health and the provincial offices of public health are responsible for legal food control operations, while the Department of Agriculture (DOA) of the Ministry of Agriculture and Cooperatives is responsible for food production. For primary food production, DOA controls the production process for the certification according to the exporting product. Government agencies will conduct inspections and control tests by random sampling. Monitoring of food safety in the domestic market (including imported products) is carried out by inspectors of the Ministry of Public Health using a simple test kit.

In fresh produce, the food-borne illnesses associated with agricultural chemicals (e.g. pesticide residues) and pathogenic micro-organisms contaminations (Supaphol, 2010; Takeuchi and Boonprab, 2006) are a major hazard and a principal consumer concern. Therefore, the main mandatory standards for fresh fruits and vegetable products are Maximum Residue Limits (MRL) for detected chemicals, pathogenic microorganisms and pathogenic toxins, and Sanitary and Phytosanitary (SPS) measures regarding agricultural commodities and food products, based on the Codex Alimentarius and international SPS agreements, respectively. In addition, 'Good Manufacturing Practice' (GMP) mandatory standards have been established in the national law, 'Notification of the Ministry of Public Health No. 193, B.E. 2543 (2000)', for 54 types of food products, which is applied to all domestic manufacturers and foreign suppliers, in order to force food enterprises to ensure a minimum level of food safety according to Thai law or Codex Alimentarius.

Table 2.1 Thailand's food safety law, regulations, and standards for agricultural products.

Stage	Main regulations	Regulation agency
Input	Plants Act B.E.2518 (A.D.1975)	DOA (MOAC)
	Fertilizer Act B.E.2518 (A.D.1975)	DOA (MOAC)
	Plant Quarantine Act B.E.2507 (A.D.1964) amended by Plant Quarantine Act (No.2) B.E.2542 (A.D.1999) and (No.3) B.E.2551 (A.D.2008)	DOA (MOAC)
	Hazardous Substance Act B.E.2535 (A.D.1992) amended by (No.2) B.E.2544 (A.D.2001) and (No.3) B.E.2551 (A.D.2008)	MOPH & MOAC & MNRE & MOI
	Protection of Plant Varieties Act B.E.2542 (A.D.1999)	DOA (MOAC)
	Agricultural Standards Act B.E. 2551 (2008)	ACFS (MOAC)
Production and Harvest	Thai Agricultural Commodity and Food Standard (voluntary)	ACFS & DOA (MOAC)
	Good Agricultural Practice (voluntary)	ACFS & DOA (MOAC)
Post-Harvest and Distribution	Agricultural Standards Act B.E. 2551 (2008)	ACFS (MOAC)
	Standard Output Act B.E.2522 (1979)	DFT (MOC)
	Export and Import of goods into the Kingdom Act B.E.2522 (1979)	DFT (MOC)
	Food Act B.E.2522 (A.D.1979)	FDA (MOPH)
	Consumer Protection Act B.E.2522 (A.D.1979) amended by B.E.2541 (A.D.1998)	OCPB (MOPH)
Processing, Packaging and Consuming	Industrial Products Standards Act B.E.2511 (A.D.1968)	TISI (MOI)
	Factory Act B.E.2535 (1992)	MOI
	Good Manufacturing Practice (GMP) (Mandatory & Voluntary)	FDA (MOPH)
	Hazard Analysis and Critical Control Point (HACCP)	TISI (MOI) & FDA (MOPH)
	Agricultural Standards Act B.E. 2551 (2008)	ACFS (MOAC)
	Food Act B.E.2522 (A.D.1979)	FDA (MOPH)
	Consumer Protection Act B.E.2522 (A.D.1979) and amendment B.E.2541 (A.D.1998)	OCPB (MOPH)

Source: Adapted from ACFS (2011a)

Note: DOA, Department of Agriculture; MOAC, Ministry of Agriculture and Cooperatives; MOPH, Ministry of Public Health; MNRE, Ministry of Natural Resources and Environment; MOI, Ministry of Industry; ACFS, National Bureau of Agricultural Commodity and Food Standards; DFT, Department of Foreign Trade; FDA, Food and Drug Administration; OCPB, Office of The Consumer Protection Board; TISI, Thai Industrial Standard Institute.

Voluntary standards

These types of standards are not mandatory under the current law and regulations, and they should contain prescriptions that go beyond the law requirements. Therefore, individual producers or firms may decide to adopt these standards voluntarily, on the basis of both market and internal organisation requirements. Several voluntary standards have been applied in Thailand, such as Q-GAP, ThaiGAP, GLOBALGAP, GMP, HACCP and ISO 22000. Figure 2.1 shows the main voluntary standards applied in the Thai fruit and vegetables supply chain. The discussion about 3 main standards for fresh produce production: Q-GAP; ThaiGAP and GLOBALGAP will be provided in the section 2.3.2 and 2.3.3.

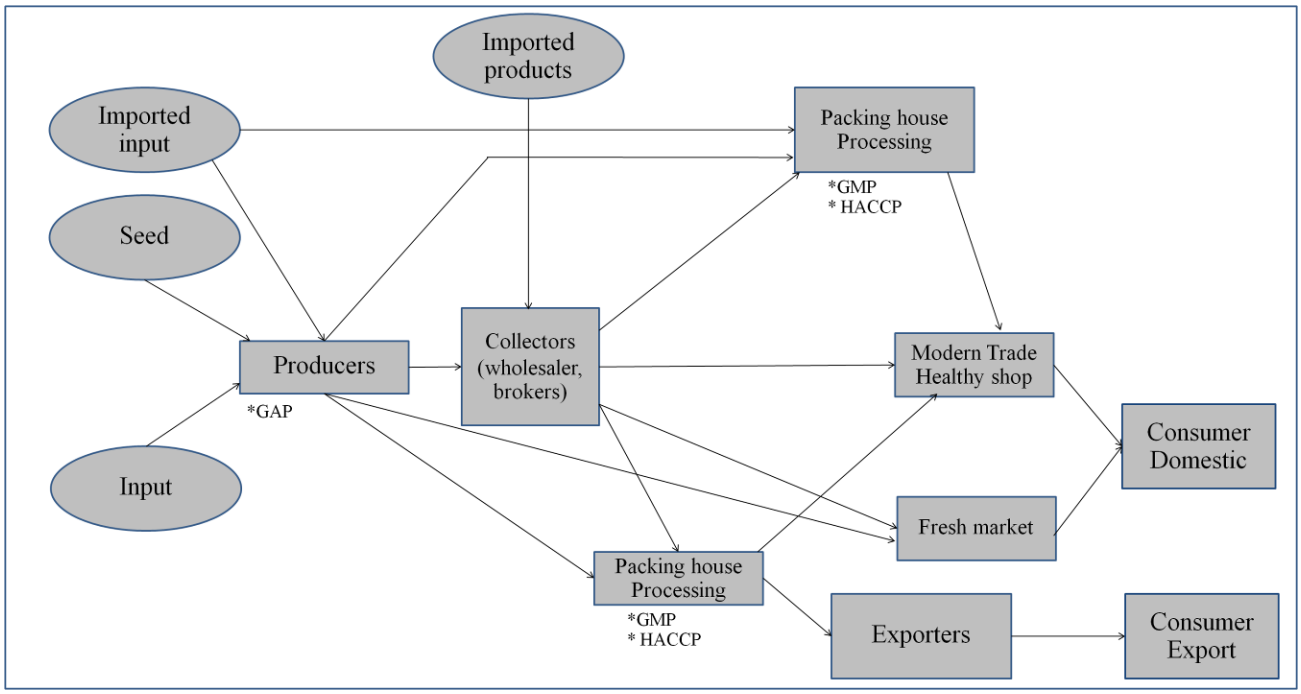

Figure 2.1 Food safety voluntary standards adopted at different levels of the Thai fruits and vegetables supply chain.
Source: Adapted from Sastranont (2007)

2.3.2 Good Agricultural Practices schemes adoption in Thai fresh produce production

According to the definition of FAO, Good Agricultural Practices or GAP are 'practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products ' (FAO, 2003). At present, GAP is not only referred to as a concept, but is predominantly recognised as a terminology used in international regulatory frameworks as private or public voluntary standards, e.g. GLOBAPGAP, FAO GAP, USDA GAP. GAP standards consist of four basic modules - (1) food safety, (2) environmental management, (3) worker health, safety and welfare and (4) product quality - covering production, harvesting, postharvest handling on farm and in packing house (FAO, 2003). Even though the general concept of GAP standards is the same, differences in details of practices, levels of implementation and enforcement exist among individual standards.

In the international market, GAP has been increasingly promoted by operators in the private sector, such as food processors and retailers in response to the emerging consumer demand for quality and safe food products, as well as to maintain and improve reputation and off-load legal liabilities (e.g. Fulponi, 2006; Hatanaka *et al.*, 2005; Souza Monteiro and Caswell, 2009; Sterns *et al.*, 2001). This trend has had consequences on both the Thai agri-food production and food industries, causing both Thai government and industry to respond by developing and implementing GAP schemes in agri-food production to maintain a competitivity on the international market (Sardsud, 2007). Currently, Thai agricultural producers and operators have adopted three main GAP schemes: Q-GAP (national GAP of Thailand), ThaiGAP and GLOBALGAP.

GLOBALGAP

GLOBALGAP is a private international company that sets voluntary certification standards and procedures for good agricultural practices. It is based in Germany and was originally created in 1997 by a group of European supermarket chains belonging to the Euro-Retailer Produce Working Group (EUREP) as EurepGAP and changed its name to GLOBALGAP in 2007. GLOBALGAP aims to establish one standard for GAP with different product applications enabling a coverage of the global agricultural production. It focuses mainly on food safety and traceability, with some requirements on worker safety, health and welfare, and environmental considerations. GLOBALGAP is a pre-farm-gate standard or on-farm standard, which covers the certification of the whole agricultural production process of the product from before the seed is planted, until the product leaves the farm. The standard also includes the control points for traceability and segregation, thus allowing for the identification of certified products out of others. However, this standard is not communicated to consumers directly, as it was principally designed as a business-to-business label (www.globalgap.org).

The GLOBALGAP series covers several standards, GLOBALGAP Integrated farm assurance standard (IFA) version 4.0 edition 4.0-2 (2013) is most relevant to fruit and vegetable production. GLOBALGAP is comprised of several Control Point & Compliance Criteria (CPCC), divided into 3 main groups - All Farm base (AF), Crop Bases (CB), and Fruit and Vegetables production (FV), which involve both on-farm and post-harvest and handling activities, including record keeping and traceability. It aims to establish a complete control and monitoring system, thereby allowing an efficient back-tracing of all registered products. There are four available GLOBALGAP certification options: options 1 and 3 require an individual certification, and options 2 and 4 allow a group certification. Individual certification is held by an individual farmer and the verification is done annually through external inspection by third party certification bodies. Group certification is obtained by a farmer group and the verification is done through internal inspections managed by the farmer group plus one external inspection and audit per year. In addition to annual inspection, GLOBALGAP includes additional unannounced inspections by third party certification bodies as well. Certificates are valid for 12 months. Under option 3 and 4, growers are certified by obtaining an equivalent benchmarked scheme (national or local standards that has benchmarked with GLOBALGAP, for instance, ThaiGAP).

The general certification process for crop production is as follow (GLOBALG.A.P., 2011): producers who are interested in implementing GLOBALGAP download and read GLOBALGAP normative documents from the website; then implement CPCC on farm and implement Quality

Management System; subsequently, producers choose a GLOBALGAP approved certification body (CB) and register for GLOBALGAP with a chosen CB; producers perform an auto-inspection using the GLOBALGAP checklist (in case of group certification and individual certification with multiple sites, producers perform Internal Quality Audit and Internal Inspections of each producers in the handling unit); their farms will be inspected by external audit by a CB – both announced and unannounced inspections- and finally the certification decision will be made by the CB.

Thai exporters are the most active in requesting their suppliers to implement GLOBALGAP. However, since GLOBALGAP is not yet necessary for the regional export market and because of its stringent regulation and the high cost of implementation, the standard is adopted by the exporters oriented towards the EU market only. In fact, there is only one Thai supplier, KC Fresh, who is a supplier member of GLOBALGAP. In December 2012, there were 277 Thai producers certified under the GLOBALGAP standards (GLOBALG.A.P., 2012). Difficulty in accessing the Internet, download of GLOBALGAP normative documents and manual, the language barrier, lack of know-how in completing required documentations and records and high certificate costs, have been documented as the main constraints for Thai producers in adopting GLOBALGAP standards [The United Nations Conference on Trade and Development (UNCTAD, 2005)]. In 2011, the Thai National Interpretation Guidelines for Integrated Farm Assurance Control Points and Compliance Criteria were approved by GLOBALGAP and became obligatory from February 23, 2012. This manual is written in both English and Thai and is expected to be more accessible by Thai farmers. The GLOBALGAP Option 2 group certification has been introduced in Thailand in order to cope with high cost, as the cost in this option is relatively lower than those in Option 1 individual certification (Will, 2010). In response to this new standard, three farmer groups consisting of 50 farmers certified with GLOBALGAP Option 2 in 2008, and thirteen farmers groups with 200 farmers each were certified in 2010 (Chuenprayoth, 2011).

National GAP of Thailand or Q-GAP

National GAP or Q-GAP standard has been developed by the Thai government as a part of the national strategy for food safety and has been implemented since 2004. Q-GAP standard is a public voluntary standard aiming to improve quality and safety of agricultural products with respect to the environment and ecology. In addition, the standard's objective is to increase consumer confidence in the domestic market and to enhance competitiveness in the international marketplace (ACFS, 2011b).

The Ministry of Agriculture and Cooperatives, responsible for the food safety policy, assigned the National Bureau of Agricultural Commodity and Food Standard (ACFS) to act as a national accreditation body and the Department of Agriculture (DOA) to act as a national certification body. Q-GAP training and advisory services for producers/producer groups are offered by the Department of Agricultural Extension (DOAE). The scheme is voluntary, managed by the government (the legal owner is ACFS), and free of charge.

The standard consists of eight key points including requirements and farm production inspection practises. The control points are: (1) water source; (2) cultivation site; (3) use of agricultural hazardous substances; (4) product storage and on-site transportation; (5) data records; (6)

production of disease and pest-free products; (7) management of quality agricultural production and (8) harvesting and post-harvest handling.

The implementation process is as follows: producers interested in implementing Q-GAP submit the application form and relevant documents to the Office of Agricultural Research and Development (OARD) located in the local area; then, approved producers participate in the both a theoretical and practical training course on Q-GAP provided by DOAE; afterwards, producers conduct farm cultivation according to Q-GAP requirements under the supervision of DOA; the farm inspection is conducted by OARD according to the specific crop protocols; subsequently, the producers are informed of the results of the inspection and within a given number of days they have to perform correction actions (if needed); the GAP inspection form is submitted to the OARD board to review and presented to the sub-committee on GAP certification; this sub-committee compiles and submits the information to the Committee on Food Safety Management, which then issues the GAP certificate; finally, producers who obtain GAP certification are permitted to label their products with GAP logo: the 'Q' mark (Figure 2.2). In addition, the certified farms will be audited at least one more time by the government agencies after obtaining the certification.

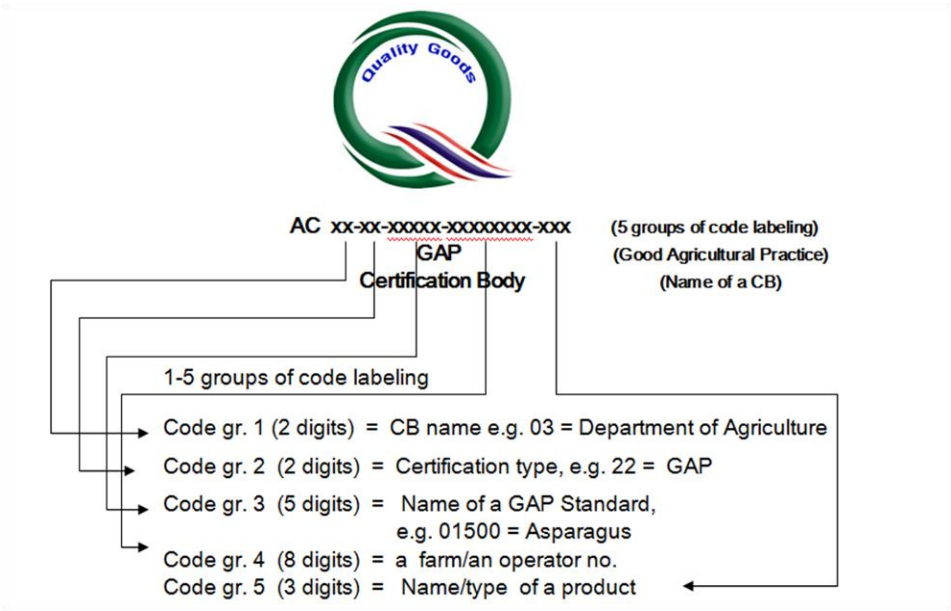

Figure 2.2 National GAP logo (Q-GAP) with code labelling.
Source: Wannamolee (2008)

The standard does not include the regulations for traceability and segregation of certified products. Consequently, difficulties to track products and to recall and/or withdraw product in case of non-conformity may arise. The government agencies attempt to resolve this problem by establishing criteria for Q mark usage. According to TACFS 9005-2548 (2005)[3], 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

[3] Criteria for the Use of Certification Marks Q and Q premium on Agricultural and Food Commodities issued by ACFS

requirement; and products using Q mark will be tested for quality and safety. Nevertheless, the traceability of these products throughout the supply chain was still considered ineffective (UNCTAD, 2005).

Currently, DOA has provided crop protocols and certifications for 316 crops. As of the 2 January 2013, DOA has registered 237,046 farms (4.03% of total farms in Thailand) for GAP, as of 231,792 farms have been GAP certified with a combined area of 1,900,904 rai or 3,041.45 km^2 (1.25% of total agricultural area in Thailand). The majority of certifications for fruit pertains to longan (41,864 farms/249,962 rai/399.94 km^2), long kong (7,363farms/33,279 rai/53.25 km^2) and mangoesteen (7,149 farms/47,740 rai/76.38 km^2), and for vegetables includes chili (2,046 farms/4,318 rai/6.91 km^2), asparagus (1,218 farms/2,993 rai/4.79 km^2), and lemon (779 farms/4,436 rai/7.10 km^2) (DOA, 2013).

Table 2.2 compares number of GAP farms, Q-GAP certification and area among main export products in 2005, 2008 and 2012. It seems that the amount of farm land area of Q-GAP in Thailand is decreasing both in general figures and in specific export products. This may be a consequence of producers, especially export producers, switching to GLOBALGAP and ThaiGAP standards. However, to the best of our knowledge, there is no clear evidence of these changes on the statistical reports of GLOBALGAP and ThaiGAP area in Thailand.

Table 2.2 Comparison of Q-GAP farms, Q-GAP certified farm and area among main exports products in 2005, 2008, 2012.

Crops	No. of Q-GAP farms			No. of Q-GAP certified farms			Q-GAP area (km^2)		
	2005	**2008**	**2012**	**2005**	**2008**	**2012**	**2005**	**2008**	**2012**
Longan	n.a.	n.a.	70,134	n.a.	59,247	37,986	n.a.	581.78	522.84
Mango	7,762	n.a.	9,361	6,248	7,469	6,275	n.a.	164.65	152.77
Baby corn	1,903	n.a.	1,656	1,551	1,382	716	n.a.	7.36	6.41
Asparagus	3,803	n.a.	2,969	3,416	1,608	1,345	n.a.	5.33	4.56
Others	n.a.	n.a.	165,336	n.a.	100,180	94,241	n.a.	1,147.09	1,141.04
Total	**n.a.**	**363 946**	**249 456**	**n.a.**	**169 886**	**140 563**	**n.a.**	**1 906.21**	**1 827.62**

Source: Statistics of 2012 are from GAP DOA Online database, DOA (2012); Statistics of 2008 are from Wannamolee (2008); Statistics of 2005 are from UNCTAD (2005)
Note: n.a. = no data available

ThaiGAP

ThaiGAP is a Thai private sector body that set up the Thai voluntary private standard for good agricultural practices covering all processes from seeding to handling. It was established in 2007 with the aim of building confidence among business partners and consumers that the products are in compliance with international standards as well as environmental sustainability criteria. It has been developed through the collaboration of various governmental and private agencies (www.thaigap.org). The owner of ThaiGAP is the Board of Trade of Thailand (BOTT). ThaiGAP Institute is the main organisation and it consists of (1) National Food Institute serving as the

ThaiGAP secretariat, responsible for finance, administration, and certification scheme; and (2) the Kasetsart University responsible for technical advice and capacity building for ThaiGAP members. Other components of ThaiGAP Institute are Independent National Standard Committee recognised by BOTT, members (producers, exporters, retailers) and registered certification bodies (CMi, SGS, and TÜV Nord CERT).

The certification is divided into two levels: Level 1 is for export products; and Level 2 is for domestic market, both levels have 2 options (individual and group). ThaiGAP version 2.0 Level 1 targets international market because it has already completed benchmarking procedures for Approved Modified Checklist (AMC)[4] and has been acknowledged as a GLOBALGAP Integrated Farm Assurance Standard Version 4 for Fruit and Vegetables equivalent in March 2013 (GLOBALG.A.P., 2013), indicating producers and exporters who obtain ThaiGAP Level 1 certification can enter into the markets requiring GLOBALGAP certification. ThaiGAP Level 2 targets retailers in the domestic market, in order to improve the food safety standard in the domestic market starting from high-end market; hence, it was designed to be an intermediate standard between GLOBALGAP and Q-GAP. Currently ThaiGAP Level 2 has been applied as a pilot test with 50 farmers who are suppliers linked with internationally owned retail chains operating in Thailand such as Top, Siam Makro, and Big C (Wattanavaekin, 2011). As of 2012, ThaiGAP Level 2 will be implemented with local retailers (Chuenprayoth, 2011). In September 2013, The Thai Chamber of Commerce and Board of Trade of Thailand and Thai Retailers Association together with five large retail chains (Siam Makro, Central Food Retail, CP All, Tesco Lotus, and Big C) signed the agreement to support and distribute food products with ThaiGAP certifications (Thai Post, 2013).

Implementation of the certification process starts from when the application for membership to ThaiGAP Institute is made, then producers or firms apply for certification and sign a contract with ThaiGAP CB (third party CB) on mutual agreements. Subsequently, farms are assessed by CB at least 2 times, if the farms passes the auditing process (100% major must; 95% minor must; recommendation), the ThaiGAP certification will be issued by CB. Subsequent and unannounced inspections will be conducted as well. The certification is valid for 1 year (ThaiGAP, 2010).

2.3.3 Comparison of Q-GAP, ThaiGAP, and GLOBAPGAP standards

Comparison of the main features of the GAP standards

We compared the main features of the GAP standards adopted in Thailand regarding to general issues and GAPs concepts (Table 2.3 and Table 2.4). Currently, products with Q-GAP certification have been accepted only in domestic and regional markets (e.g. China, Singapore, Taiwan, Malaysia, etc). The system and certification mark is not internationally recognised (Wipplinger *et al.*, 2006). The main reason is that farm practices, standards and enforcement do not meet the higher level demanded by the international standard, and the tracking and tracing system is considered ineffective. In some regional markets, like Japan, customers are asking for additional samples and

[4] The checklists of ThaiGAP are recognized by GLOBALGAP as fully conforming with its CPCCs and general rules as scheme management rules for certification

inspection for chemical residues and biological contamination. While in the EU and the US markets, more stringent standards such as GLOBALGAP are required. Furthermore, the entire GAP certification process is all carried out by the government, from setting the standards and serving as the national regulatory body to providing advisory service, carrying out farm inspection and finally issuing the certification. Since in the business environment usually much more confidence is put in quality assurance systems managed by private organizations, the credibility of the standard and 'Q' label is still low (UNCTAD, 2005). The Thai government is planning to out-source the inspection and auditing job to third-party private firms in order to gain higher acceptance and credibility in the international market; however, this process has not yet been completed (Sardsud, 2007). Currently, there is no private agent (national or international) acting as a certification body.

ThaiGAP is currently adopted only by suppliers associated with exporters; however, it aims to extend its coverage to Thai food retailers and high-end market suppliers in the domestic markets through ThaiGAP Level 2 (Chuenprayoth, 2011). ThaiGAP is a new standard thus time to build up credibility and reputation in the domestic and international market is required. However, its main advantage is that this standard is led by a private operator and auditing is performed by third party firms, conferring credibility to the standard. On the other hand, Thai suppliers have better access and obtain advice and feedback in Thai language.

At present, Q-GAP standard focuses mainly on chemical contamination and residues, therefore the extension of coverage to biological and physical contamination are required to make the standard more in line with GAP principle. The worker welfare and environmental issues are also missing from Q-GAP standard. Documentation and record keeping are also mentioned by several studies, which highlight that Q-GAP does not emphasise these issues enough, thus possibly resulting in inadequate tracking system (e.g. UNCTAD, 2005; Wannamolee, 2008). ThaiGAP, which is considered a middle standard between Q-GAP and GLOBALGAP, covered all the main principles of GAPs; nevertheless, the traceability system is in its initial stages and required further development.

Table 2.3 Comparison of the main features of Q-GAP, ThaiGAP, and GLOBALGAP certification: General issues.

Features	Q-GAP	ThaiGAP	GLOBALGAP
Ownerships	Government sector (ACFS)	Private sector (the Board of Trade of Thailand)	Private sector (GLOBALG.A.P.)
Duration of Certification	2 years for annual crops and 3 years for perennial plants	12 months	12 months
Classifications	There is no level	Level 1: Export market; Level 2: Domestic market Both levels have 2 options: individual and group certification	Option 1 and 3: individual certification; Option 2 and 4: group certification
External audit and inspection responsibility	Government officers	Third party certifiers (accredited private firms)	Third party certifiers (accredited private firms)
Cost	Free of charge	High service charge	High service charge
Recognition by the market	Domestic and regional markets	International. Equivalence with GLOBALGAP but still known only among trade partners of Thai companies (e.g. European partners)	International markets

Source: Our analysis of contents of public documents describing the standards.

Table 2.4 Comparison of the main features of Q-GAP, ThaiGAP, and GLOBALGAP certification: GAP issues.

Features	Q-GAP	ThaiGAP	GLOBALGAP
Food safety	Emphasis mainly on chemical contamination and residues	Concern on the 3 main contamination hazards in crop production: chemical; biological; and physical contamination	Concern on the 3 main contamination hazards in crop production : chemical; biological; and physical contamination. Strict regulations about pesticide storage and pesticide residue limits
Traceability	No clear traceability system required	It requires producers to establish a complete control and monitoring system so the system can be tracked and traced effectively	It requires producers to establish a complete control and monitoring system so the system can be tracked and traced effectively
Worker welfare & personal hygiene and sanitary facilities	No Control Point & Compliance Criteria (CPCC) concerns to this issue. Depends on labour and public health laws	CPCC covers this issue	CPCC covers this issue
Environmental issues	No CPCC concerns to this issue. Depends on environmental laws	CPCC covers this issue	CPCC covers this issue

Source: Our analysis of contents of public documents describing the standards.

Perceptual map of the GAP standards

In order to draw a perceptual map of the GAP standards described above, overall similarity scores to 21 unique pairs of the 7 GAP standards were assigned and analysed by using the *mdsmat* model in the Stata 11.0 software package (Hair *et al.*, 2010). The appropriate dimensionality was chosen by looking at the average measures of fit, the improvement of Kruskal's stress (Kruskal and Wish, 1978) and R squared parameters as the number of dimensions increases. A two-dimensional solution was selected as a solution most appropriate and easy to interpret. It explained 82% of the variance (Kruskal's stress = 0.1787), while a three-dimensional solution provided only a small improvement in the overall fit**.**

Figure 2.3 presents the location of the GAP standards in the two-dimensional space. Points mapped close together are similar while points mapped further apart are dissimilar. Visual examination of the location of the GAP standards reveals four distinct clusters: (1) to the top right, GLOBALGAP Level 1, GLOBALGAP Level 2; (2) to the bottom right, ThaiGAP Level 1 option 1 and option 2; (3) to the top left, Q-GAP; and (4) to the bottom left, ThaiGAP Level 2 option 1 and 2. It is evident that the position of the objects reflects mainly the differences among the standard schemes, while individual differences of standards that belong to the same standard schemes are in our perception less important.

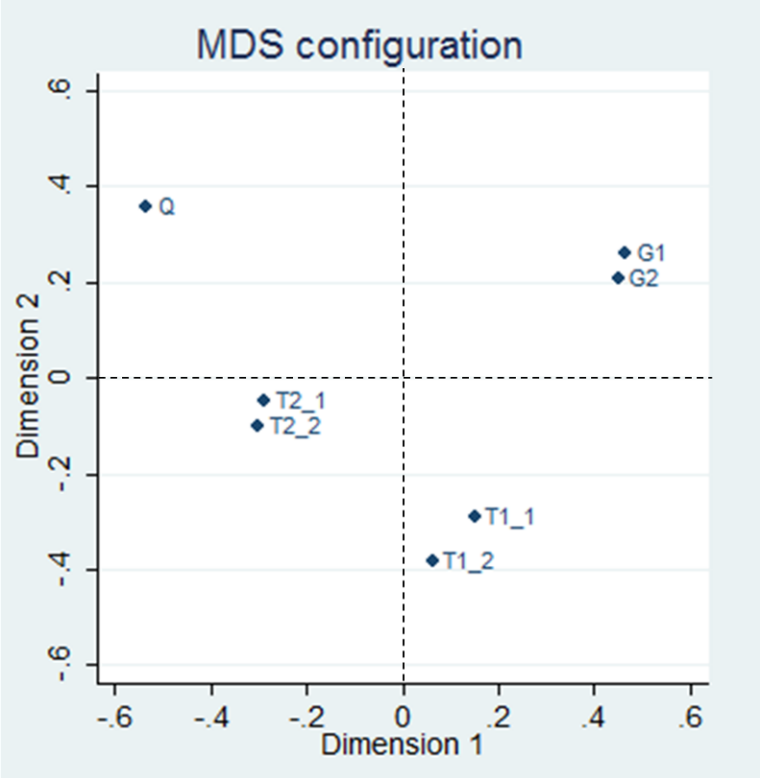

Figure 2.3 Perceptual map of the GAP standards on 2 dimensions.

Note: The map is based on the similarity judgements given by the authors. G1 = GLOBALGAP option 1, G2 = GLOBALGAP option 2, T1_1 = ThaiGAP Level 1 option 1, T1_2 = ThaiGAP Level 1 option 2, T2_1 = ThaiGAP Level 2 option 1, T2_2 = ThaiGAP Level 2 option 2, Q1 = Q-GAP Level 1, Q2 = Q-GAP Level 2, Q3 = Q-GAP Level 3

In order to interpret the stimulus space, the authors examined the relevant attributes that could be considered to underlie these two dimensions and agreed that 'Trustworthiness' and 'Usefulness in the business' (recognition in the market) may be the principal attributes. The horizontal dimension (dimension 1) may be interpreted as 'Trustworthiness', placing on the right the most trustworthy schemes. The vertical dimension (dimension 2) is interpreted as 'Usefulness in the business', in which a position on the top indicates a more useful business scheme because of recognition by customers or consumers (the latter in the case of Q-GAP). It should be noted that standards on the left are characterised by a more international approach, whereas standards on the right are more domestic.

Regarding trustworthiness, the GLOBALGAP standard is deemed the most trustworthy, followed by ThaiGAP Level 1, and ThaiGAP Level 2 respectively, the different options do not determine perceived differences; on the contrary, Q-GAP appears to be perceived as less trustworthy. Considering business usefulness, Q-GAP and GLOBALGAP appear to confer a higher competitive business advantage for companies than ThaiGAP, as they are already well established in the Thai and international markets, respectively, and have been widely recognised by the customers. In fact, Q-GAP is communicated to consumers using the Q mark label on quality products in the Thai domestic market and GLOBALGAP is the *de facto* standard for entry into the international market, and is considered almost as a ticket-to-ride for EU importers. Regarding the ThaiGAP standards, ThaiGAP Level 2 has been just recently implemented in the domestic market resulting in a low awareness of the standard; however, since it will be communicated among domestic consumers, it is perceived as more competitive than ThaiGAP Level 1 in the Thai market. At the same time, ThaiGAP Level 1 may be less attractive to an export company because it is too similar to GLOBALGAP, thus a company may preferentially select GLOBALGAP instead as it is more accepted in the international markets. The distances between different options in GLOBALGAP and ThaiGAP standards may depend upon lower trust in group's implementation and control than the individual ones.

It must be emphasised that this perceptual map represents the subjective authors' perceptions only of the different GAP standards.

2.3.4 Challenges in the adoption of food safety assurance system in Thai fresh produce production

Although GAP standards adoption clearly confers numerous benefits (for instance, promotion of food safety and sustainable agriculture, enhancing competitiveness of Thai products in the international market, etc.), several challenges exist constrain the implementation of GAP in Thailand. These challenges may be grouped into production challenges, distribution and marketing challenges, and certification, enforcement and labelling challenges. The following sections discusses these aspects in greater detail.

Production challenges

The low market incentive to adopt GAP is the main challenge in the agricultural production tier of the food supply chain. GAP certified products normally do not obtain a premium price, while certification requires farmers to make an initial investment and to regularly spend money and time to learn, implement and manage the system. Therefore, there are few producers in implementing GAP and most are suppliers of exporters or other large retailers for whom GAP is a prerequisite for doing business (Sardsud, 2007). GAP implementation and especially record keeping and certification will increase production costs, while in many cases there is no expectation that product price could increase accordingly, except for companies that are able to access export markets (Canavari and Spadoni, 2004; Gawron and Theuvsen, 2006; Jahn *et al.*, 2005; Schulze *et al.*, 2008; Soon, 2012). The adoption of any FSAS and Quality Management System (QMS); however, does usually improve the competitiveness of companies because of its impact on internal organization and management procedures. This benefit may not be perceived immediately by the companies/farms that consider a FSAS and QMS implementation (Lombardi *et al.*, 2011). Hence,

many producers do not see the advantage of GAP adoption. This problem is connected to the lack of awareness about safety, environmental and social impacts of agricultural practices; as a result there is a resistance to changing already established farming practices. In addition, pesticides remain a cheap solution for farmers as subsidies are provided for chemical products and high labour costs (Sardsud, 2007). This situation is usually common in developing countries where domestic markets have low demand on high quality products or alternative export markets do not require strict regulations, hence small producers are less inclined to comply with international stringent standards (i.e. GLOBALGAP) as certifications come with a high cost burden yet no price incentives (Ouma, 2010).

The lack of knowledge on GAP principles and requirements is another principal barrier of GAP adoption in Thailand. This is based on insufficient information about GAP program and inadequate access to information and support services from the public and private sectors (FAO, 2007). Low levels of education and knowledge of Thai producers also hinders the implementation of GAP because in many cases they are not able to understand the main principles of quality management, which are the underlying basis for any FSAS and QMS. Without an understanding of these principles and assumptions (especially the continuous improvement principle), these systems can be perceived by producers just as an additional cost and a system that just produces additional paperwork (Sardsud, 2007; UNCTAD, 2005; Wannamolee, 2008). These issues may be overcome by appropriate training activities focusing on GAP's principles and practice issues and by finding and implementing other effective tools to keep records, instead of requiring piles of documents.

Sriboonchitta *et al.*(2008) studied the factors affecting GAP adoption in pineapple production in Thailand and demonstrated that factors associated with GAP adoption include the average farm price, having contract with buying companies, average yield, being a progressive farmer, food safety and food standard requirements of the importing countries and the farmer's own environmental concern. In contrast, age is associated with a reduced adoption. This finding is congruent with the study of Kersting and Wollni (2012) that demonstrated that positive factors affecting GLOBALGAP adoption of small-scale fruit and vegetable farmers in Thailand are household and farm characteristics, the number of agricultural training attended, support by downstream actors (i.e. exporters), education, availability of family labour, household wealth, farm size and the intensity of irrigation usage, while age of the head of the household has a negative effect on standard adoption. In addition, they found that support by exporters to implement GLOBALGAP is crucial. Together with household characteristics and training attendance, the only market condition considered as a key factor is the presence of relations with exporters.

There is evidence supporting the theory that export markets (particularly the EU market) and external pressure are dominant factors of FSAS adoption for farmers. Kleinwechter and Grethe (2006) found that association with exporters is the key factor in EurepGAP adoption among Mango producers in Peru, while the access to information and lack of knowledge appeared to be important constraints in the correct implementation of the standard. Souza Monteiro and Caswell (2009) found that factors affecting the pear industry farm-level adoption of EurepGAP traceability in Portugal are the export market (the UK), membership in producer organisations, farm productivity, specific product labels (Protected Denomination of Origin-PDO) and farmers' age. Zhou *et al*. (2011) found that firm's characteristics, expected premium, export market, brand name, e-commerce, training

frequency and traceability were affecting the adoption of food safety/quality standards in the Chinese vegetable processing sector. Jahn and Spiller (2007) investigated the adoption of the 'Qualität und Sicherheit' (QS) system among German livestock farmers and found that the main factors affecting the system adoption are customer requirement and external pressure (i.e. label's reliability, fairness of the introduction and pressure of participation). Hence, in the initial stage of the standard introduction, external markets and customer demands will have a high influence on GAP development in Thailand. As a matter of fact, currently Thai producers mostly implement GAP under contract farming and frequently rely on a few exporters and the external markets. This may affect the sustainability of GAP in Thailand in the long-run.

Several stakeholders have attempted to establish GAP with group certification in Thailand. However, this attempt is still in the initial stage and it will take time to educate and provide information to farmer groups. Furthermore, insufficient organisation of small growers in producer associations imposes a significant challenge to this type of certification (Will, 2010).

Distribution and marketing challenges

At present, the majority of collectors, brokers, wholesalers and sellers in wet market are not concerned about GAP or other food safety certification of fresh produce; they are concerned only about mandatory regulations according to national food safety laws (Buurma and Saranark, 2006). The main reason is the perception that the certification requirement will restrict transaction freedoms with producers and may increase costs, while not receiving a premium price for their product. Furthermore, the majority of Thai consumers (except in urban areas) use product's quality and price as main factors in their food choice decision, rather than food safety (Lippe *et al.*, 2010), thus resulting in low supply from the supplier side. This may be attributed to a consumer perception that 'safe' food is baseline characteristic, which is expected to be guaranteed from all products available in the market (e.g. Canavari *et al.*, 2010a; Canavari *et al.*, 2010b; Ritson and Mai, 1998; Rozan *et al.*, 2004). Furthermore, the safety of food products is a credence attribute thus it cannot be assessed; hence, quality indicators are used in purchasing decisions instead (De Jonge *et al.*, 2004; van Rijswijk and Frewer, 2008).

However, some firms may implement strict food safety regulations and standards to promote their products as having a higher quality to gain advantages in the competitive business environment (Ragona *et al.*, 2011). For instance, several supermarket chains in Thailand (e.g., TOPS, the Mall, Tesco-Lotus, Carrefour, MAKRO) are gradually introducing GAP to the domestic supply chain in order to improve food safety level and gain a reputation as high-quality supermarket chain (Buurma and Saranark, 2006). Arpanutud *et al.*(2009) mentioned that Thai distributors and food-manufacturing firms are interested in adopting food safety assurance systems such as GAP, GMP, and HACCP only when it is perceived to confer a competitive advantage, reduce transaction cost, improve quality, increase sales, gain reputation and show that the top management commits to food safety. In addition, the more food safety information the firm receives, the more likely that the firm will adopt FSAS. It was also demonstrated that Thai firms considered government agencies as one of their main information sources. Hence, food safety certification could be used as a tool to create brand reputation in the high end market (Lippe 2010). Lippe (2010) concludes that Thai consumers in urban areas are willing to pay higher prices for safety labelled fresh fruit and vegetables, thus,

creating a reward for adopting GAP also in the domestic market. The study suggests that public intervention is needed to ensure reliability and credibility of certification and labelling system.

Nevertheless, Thai consumers still consider food safety control as a task of government and rely more on government labels such as 'Q mark' and 'Food safety' (Lippe, 2010). This highlights the importance of the role played by government agencies in disseminating knowledge and information to suppliers, firms and consumers in order to improve the food safety level in the domestic market.

Certification, enforcement and labelling challenges

GAP standards managed by private sectors such as GLOBALGAP and ThaiGAP are more credible in certification, enforcement and labelling issues, as they have clear regulations and are monitored and controlled by third party certification bodies. Likewise, these standards are usually pre-requisites for entry into high-end markets and are required by business partners. Therefore, implementation of high quality standards is an imperative for suppliers in this side of the supply chain (Fulponi, 2006). However, these standards are also particularly common for producers associated with exporters only, because of high certification cost and complicated regulation. On the other side, Q-GAP managed by the government agencies faces more challenges in enforcing regulations (Sardsud, 2007). Q-GAP was established by the government and the stakeholders play only a minor role in its implementation, therefore communication between and cooperation from all actors along the whole supply chain can be challenging (Oates, 2006; Sardsud, 2007). Thus, difficulties in inspection, control and tracking certified products along the chain are generated as some actors do not participate in or are concerned about the program. Consequently, the certified products lose the ability to convey the value (as certified GAP products) to the end-consumers.

The presence of several standards may represent an advantage as producers have several choices and have the possibility to select an option most suitable for them. However, the lack of harmonisation of GAP standards implemented in Thailand creates confusion among producers and suppliers because they have to implement several standards according to the partners' requirements for domestic, regional and international markets. Therefore, benchmarking of GAP standards in Thailand with international recognised standards (e.g. GLOBALGAP) and harmonising with other coexisting GAPs may mitigate the confusion among stakeholders (Sardsud, 2007).

2.4 Conclusions and Future Research

Food safety is a national issue and Thai government and stakeholders are acutely aware of the issue. Food Safety Assurance System (FSAS) is one of the tools utilised to control and monitor food safety along Thai food supply chain. Good Agricultural Practice (GAP) is employed as a scheme to guarantee food safety, quality and sustainable agriculture in crop production. Currently there are three main voluntary GAP standards adopted in Thailand - National GAP or Q-GAP, ThaiGAP and GLOBALGAP. While GLOBALGAP is a private internationally recognised standard, Q-GAP and ThaiGAP are local standards, which have been developed by the government and private sectors, respectively.

The perceptual map we developed reveals that GLOBALGAP is the benchmark for other GAP standards, both on trustworthiness and business usefulness aspects. While ThaiGAP is perceived as possessing a higher trustworthiness than Q-GAP, Q-GAP confers a higher business advantages because it has been recognised on the domestic and regional market. In order to improve trustworthiness, Q-GAP standard regulation should be strictly enforced, the inspection should be done by third parties and an efficient traceability system need to be implemented. Whereas, promotion and marketing activity should be applied for ThaiGAP Level 2 in order to improve its recognition in the market.

Considering the current situation of GAP implementation in the Thai domestic market, the implementation is considerably weak. Apart from the voluntary standards discussed so far, there is not a comprehensive mandatory standard according to Thai law. Currently, the Thai domestic market does not provide enough market incentives for adoption (e.g. premium price or increase the possibility to entry the market or enhance the competitiveness of the supplier). Hence, most of producers do not perceive the advantages of adopting GAP, as expected market benefits derived from GAP or FSAS implementation are not apparent (Lombardi *et al.*, 2011). However, this trend seems to be slowly changing as retailers have recently started to impose GAP adoption on their suppliers to achieve higher food safety level and gain a favourable reputation as safe food providers. This has become particularly relevant in the Thai context following a series of food scares in the country such as Avian influenza (bird flu) in 2004 and the recurring, and scandals of high chemical residues on some fresh produce (e.g. Chinese Kale and cabbage). Therefore, consumers are increasingly searching for food safety guarantees in the form of a certification or trusted brands. There is also evidence that Thai consumers have increased awareness on food safety and some of them are willing to pay a higher price for safe food, especially in the urban area (e.g. Lippe, 2010; Takeuchi and Boonprab, 2006). These situations indicate that in the future, more stringent GAP schemes may be applied in the domestic market as consumers pay more attention to food safety issue.

However, further research on practitioners' and stakeholders' perceptions of standards should be conducted in order to obtain more information regarding these standards e.g. perceived trustworthiness and business usefulness from the business point of view. This could be conducted by building upon the results of this review and using investigation methods based on primary data. For instance, the MDS technique we used to subjectively describe our point of view of the standards could be further employed in the analysis of the perceptions of practitioners and to elucidate the

(dis)advantages of each standards (e.g. Canavari *et al.*, 2007). Further research on consumers' perception and willingness to pay for certified products could be conducted in order to obtain information from the demand side.

In conclusion, the problem for implementing FSAS and GAP in Thailand is rooted in the lack of knowledge and understanding of principles, and the perception of advantages (especially the internal ones) that FSAS adoption and implementation may confer among stakeholders. Therefore, a possible solution could include creating awareness about food safety and GAP among stakeholders, including the domestic consumer sector, and involving players on the system. In this context, government agencies must play an important role in disseminating knowledge and information. In our opinion, currently the most promising standard in terms of wide adoption is the Thai national Q-GAP standard. Although Q-GAP is perceived as weakly enforced and with low credibility ((because of the whole process implementation is carried out by the government), Thai consumers and domestic markets rely upon it because it is the only way to access mass producers and markets. Therefore, the next step is to improve Q-GAP to confer a higher credibility. This could be achieved by several means, such as offering more business incentives among domestic distribution channels, outsourcing auditing tasks to third party private firms, strictly enforcing the regulations, improving training, and creating documentation and record-keeping tasks more suitable for Thai producers. The adoption of Q-GAP could be a first step for many producers to perceive not only the cost but also the benefits of GAP standards. It may represent an entry level from which some of them may decide to upgrade to more demanding standards. Finally, GAP standards for domestic market may not need to be the same as international ones, but rather should be adapted to the Thai agricultural context, while still retaining important elements that ensure a high level of food safety, quality and that promote sustainable agriculture.

CHAPTER 3

DIFFICULTIES AND BARRIERS OF GOOD AGRICULTURAL PRACTICES ADOPTION IN THE THAI FRESH PRODUCE INDUSTRY: STAKEHOLDERS' PERCEPTIONS

Abstract

The research aims to explore stakeholders' perceptions of Good Agricultural Practices adoption on the production of Thai fresh produce in order to provide relevant information for policy makers and industrialists. Qualitative semi-structured interviews (n = 48) were held in Bangkok and nearby cities. The key informants were experts, the governmental authorities, producers, distributors, exporters and consumers. Data was analysed using qualitative content analysis. The stakeholders have perceived low credibility of national GAP or Q-GAP standards implementing in Thai domestic markets due to the lack of verification and tractability system; also the system is carried out by the governmental authorities. Consumers are the key persons who could drive the market of safe produce. Exporters and modern traders are main influencers on producer's adoption of GAPs. The creation of stakeholder's awareness toward food safety issues and information provision are still crucial.

Keywords: food safety assurance, supply chain, Thailand, factors influencing adoption

3.1 Introduction

Thai government has enacted a food safety policy named "From-Farm-To-Table" or "From-Farm-To-Forks" since 2004 in an attempt to improve food safety situation and image of Thai food industry. Several strategies and tools have been undertaken to monitor and control food safety throughout the food supply chain. For instance, establishing mandatory regulations on the limited level of residue and contamination in food products and promoting national "Good Agricultural Practice (GAP)" policy or "Q-GAP" as a voluntary standard to reduce the use of agrochemicals. As a follow up plan, the national strategic plans of "Standard, Quality and Safety for Agricultural Commodities and Food Products" has been announced and enacted during the period 2010-2013 (ACFS, 2011b).

In Thai domestic market; however, the occurrence of Foodborne illness, such as, diarrhea still take place annually, including other several food scare outbreaks in Asian region. The Ministry of Public Health (MOPH) reported that 103,420 Thai (from total 65 million people) were ill from food poisoning with Morbidity rate 162.98/100,000 people in 2009 (Bureau of Epidemiology, 2009). Thai Health Promotion Foundation announced that although the number of food poisoning cases in Thailand has been stable over last ten years, Thai population have higher risk to uptake food products that may cause food poisoning during last 20 years (Thai Health Promotion Foundation, 2010). There are several food scares outbreak in the Asian region as well, such as, the first outbreak of Avian influenza or bird flu in Thailand in 2004 (BBC, 2004) and several times recurring, and melamine contaminated in milk imported from China in 2008 (Byrne, 2008). Literature discuss that

this situation caused by the weak enforcement in the implementation of food safety assurance system (FSAS) in Thai domestic supply chains, as well as, the ineffectiveness of the audit and traceability (FAO/WHO, 2004; UNCTAD, 2005; van der Valk and van der Roest, 2009; Wannamolee, 2008). However, the reasons behind may contribute not only to the structure or the enforcement of the systems, but also the perceptions of the actors along the supply chain toward the adoption and implementation of FSAS since perception and attitude have highly impacted on the behaviour. Holleran *et al.*(1999) underline that although assurance systems, for instance, GAPs from different countries have common element and concept, the national assurance systems, particularly relating to production and processing practices, reflect national norms and cultures, which refer to perception and attitude as well.

In order to design and implement appropriate food safety management strategies, it is important to understand how different tiers in the food supply chain differ in their perceptions toward FSAS applied in the chain (Ellen van *et al.*, 2006; Frewer, 2001). Therefore, perceptions of different tiers toward food safety regulations and standards implementation, including potentials and barriers of the development should be recognized. Currently no known published research exists which mention the opinion of the stakeholders along the Thai food supply chain. This study is aimed at filling this gap by exploring stakeholders' perceptions toward FSAS, particularly National GAPs or Q-GAP which is the most dominant standard in the Thai fresh produce chain. Q-GAP implementing in fresh produce industry is discussed in this study because fresh produce is the most concern products by consumers at domestic markets (Lippe, 2010; Vanit-Anunchai, 2006; Vanit-Anunchai and Schmidt, 2006) and Q-GAP is the basic food safety standard. The aims of this study are: to capture the current situation of the FSAS in Thailand; to explore and examine differences and similarities among stakeholders' perceptions; and to define the bottom neck in the system. The paper uses data from in-depth interviewing of stakeholders, including experts, certification bodies, farmers, distributors, and consumers. The rest of this paper is structured as follows: in the following section, we describe the supply chain of Thai fresh produce, including GAPs implementation in the supply chain. Methodology is described in the section 3.3. In section 3.4, we present the results of our analysis. Section 3.5 discusses and section 3.6 concludes.

3.2 The Supply Chain of Thai Fresh Produce

Although fresh produce does not hold a big share in Thai agricultural area, it is still a significant part of Thai cuisine and generate incomes to producers. More than 12 million ton of fruits and vegetables has been produced annually and more than 95% is for domestic consumption. The domestic consumption[5] of fresh produce has been constant during 2001-2009, around 12 million ton per year, except the increasing to 13 million ton and 14 million ton in 2006 and 2007 sequentially (FAO, 2012). Most of fresh produce has been distributed through traditional market (fresh market) as Thai consumers still mainly purchase food products through this channel and only 34% of total food sales go through the modern trade such as supermarkets and hypermarkets (Gorton *et al.*, 2011).

[5] Domestic consumption is estimated from Production + Import - Export

3.2.1 Traditional and modern supply chains

In the traditional marketing chain, independent farmers produce fresh fruits and vegetables and sell some parts of products directly in local food markets. The majority of products will be collected by local collectors (e.g. cooperative or local middlemen), then products will be transported to district and provincial wholesale market before transporting to central wholesale markets (e.g. Talaad Thai and Talad Simummuang in Bangkok). Finally, small retailers will go to buy products in the central wholesale markets to sell to consumers in fresh markets.

Since the traditional marketing chain is complicated and consists of several stakeholders, the food quality and safety standards are difficult to achieve; as a results, fresh produce at domestic markets are less controllable in terms of quality and safety. Food quality and safety control exists only in the level of basic laws and regulations such as Maximum Residue Level (MRL) of agro-chemical in fresh products which are controlled by the governmental authorities.

In the modern marketing chains, suppliers or vendors contact farmers and farmers collect products for them according to their specific requirement, mostly under contract farming. In some cases, vendors may take products from wholesale markets as well. Under contract farming, product quality and safety control can be better guaranteed since it is regulated by contracts and can be traced back from the shelves to the farms. Exporters usually prefer the modern chain as they can gain fully control on quality and safety of the products. Several FSAS have been applied for export markets, such as, Q-GAP, GLOBALGAP, ThaiGAP, GMP, HACCP and traceability systems. Lately, high-end markets and modern trades in domestic markets also turn to the modern chain in order to cut-off the middlemen and to improve quality and safety of the products as well as to differentiate themselves from the competitors. The basic standard in domestic markets is Q-GAP. However, this type of chain is still very limited.

Thai fresh produce marketing chain tends to slowly develop into modern chain as the increasing market share of fresh produce sold at supermarket chain indicated (Schipmann and Qaim, 2011), particularly in the urban area such as Bangkok and Chiang Mai. Nevertheless, the majority of fresh produce is still sold through fresh markets.

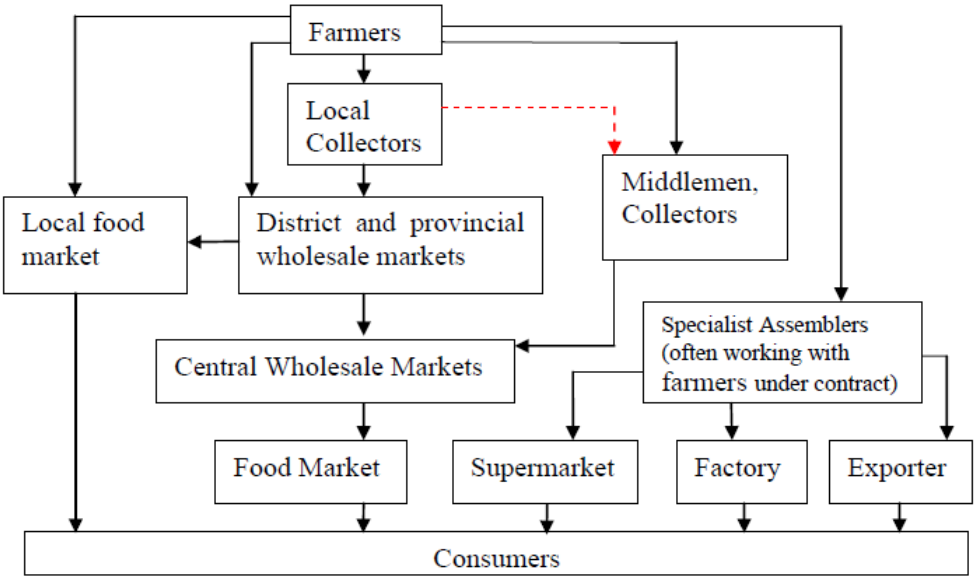

Figure 3.1 Vegetable distribution channels in Thailand.
Source: Johnson *et al.*(2008)

3.2.2 National GAP implementation in fresh produce production in Thai market

National GAP or Q-GAP is the most prominent voluntary standards at domestic markets. It was introduced by the Ministry of Agriculture and Cooperatives (MOAC) since 2004 as a part of the national strategy plan for food safety. It aims to improve quality and safety of agricultural products with respect to environment and ecology. Another purpose is to increase Thai consumer confidence in food sold at domestic markets and to enhance competitiveness of Thai products in the international market (ACFS, 2011b).

Q-GAP for fresh produce is carried out solely by the government authorities under the MOAC: the National Bureau of Agricultural Commodity and Food Standard (ACFS) is a national accreditation body; the Department of Agriculture (DOA) is a national certification body; and the Department of Agricultural Extension (DOAE) provides training and advisory services for producers/producer groups. The service is free of charge as it is carried out by the government. The producer who complies with Q-GAP requirements will obtain the certification from ACFS. Products with Q-GAP certification, which have been processed and packed and certified according to GMP or HACCP regulations can be labelled with "Q" mark.

Although Q-GAP has been introduced for nearly a decade, the adoption of GAP for domestic market is not widely spread. As of 20 May 2013, DOA has registered 158,215 farms (2.7% of total farms in Thailand) for GAP, as of 143,245 farms have been certified GAP with the area of 930,239 rai or 1,488.38 km^2 (0.6% of total agricultural area in Thailand) (DOA, 2013). Most of certified products are distributed through modern trades (i.e. supermarket and hypermarkets). Furthermore, it has been a subject of discussion that this standard may not be able to reduce agricultural pesticide use in the fresh produce production due to the inefficiency of the system to train the farmers and to control and monitor farm production (Schreinemachers *et al.*, 2012). Inability to trace the certified

products in the supply chain is criticise as the main weakness of the system as well (van der Valk and van der Roest, 2009; Wannamolee, 2008).

3.3 Methodology

The objective of this study was to use qualitative methodologies to identify the key issues that stakeholders concern regarding GAPs adoption in the Thai fresh produce supply chain. Given that the research is exploratory in nature, it was decided not to impose a theoretical model or framework on the data acquisition and analysis. The intention was not to test a particular theoretical perspective, but to examine a relatively under-researched area and to generate the hypotheses to be tested in the quantitative phase of this research in the future.

In an attempt to deal with complexity and rich diversities of the stakeholders' perceptions in this study, exploratory research based on qualitative approach was employed (Myers, 2009). We used semi-structured interview in this research as it allows the interviewer to use some pre-formulated questions covering the important issues that are expected to be treated during the interview. Semi-structured interview protocols (see Appendix 3.1, 3.2, 3.3 and 3.4) for different tiers in the supply chain were developed following the two research purposes, namely: (1) how do they perceive Q-GAP standards implementing in Thailand; (2) what are the potential and barriers of Q-GAPs adoption in the supply chain of Thai fresh produce. The protocols contained a series of open-ended questions introducing wide topics and inducing the informant to raise salient issues which he or she thinks are important and relevant to the topic of interest during the conversation (Myers, 2009).

3.3.1 Recruitment of respondent

The target groups are key informants in each tiers of Thai fresh produce industry who have knowledge and could highlight the relevant problems or issues on a specific topic. The respondents consisted of experts (government authorities, certification body and academic sector), farmers (adopt and do not adopt GAPs), distributors (collectors, wholesale markets, retailers and exporters) and consumers. The study focused on the urban area, mainly in Bangkok.

All respondents except consumers' group were recruited by purposive non stochastic sampling. The snow-ball sampling procedure was also applied. Potential respondents except the consumer were contacted in advance by personal connections via email and telephone. We interviewed 32 out of 45 selected contacts— 7 experts, 4 farmers, and 21 distributors. For consumers, the researcher went to different distribution channels: (1) fresh markets; (2) modern trades (supermarket and hypermarket); and (3) healthy shops, to ensure that a range of consumer types was included in the study. The selection criteria were consumers' shopping habits (a main food shopper of the household and frequently purchase fresh produce, at least 1-2 a week), and socio-demographic characteristics - gender (at least two-thirds are female) and age (at least two-thirds age above 30 years old). The consumers were approached randomly and asked for their cooperation. We interviewed 16 consumers — 5 consumers at healthy shop, 5 consumers at modern trade and 6 consumers at fresh market. The participation of respondents based on voluntarily basis. For confidential purpose, the specific names of the respondents and the company were preserved. The details of the characteristics of the interviewed companies and respondents are showed in Table 3.1.

Table 3.1 Characteristics of respondents.

Tier/Group	Respondents (persons)	Percentage in the group
Expert	**7**	
Governmental authorities	3	42.85%
Academic	1	14.29%
International Organization	2	28.57%
Local certification body	1	14.29%
Producer	**4**	
Export market, ThaiGAP adoption, certified	1	25%
Domestic market, Q-GAP adoption, certified	1	25%
Domestic market, Q-GAP adoption, not certified	1	25%
Domestic market, do not implement any GAP	1	25%
Distributor	**21**	
Collector	***7***	
Importer, collector and wholesaler	2	28.57%
Collector and wholesaler of GAP and non-GAP products	4	57.14%
Collector and wholesaler of non-GAP products	1	14.29%
The main wholesale market of Thailand	***2***	
Retailer	***10***	
Fresh market	4	40%
Hypermarket (the main hypermarket)	2	20%
Supermarket (one of the biggest supermarket chain)	1	10%
High-end fresh market (the most important one)	1	10%
Healthy shop (one of the most important shops)	1	10%
Practitioner (sell food in a school)	1	10%
Exporter and pack house	***2***	
Impose GLOBALGAP on the farmers	1	50%
Impose Q-GAP on the farmers	1	50%
Consumer	**16**	
Shopping at fresh market	6	37.50%
Shopping at modern trade	5	31.25%
Shopping at healthy shop and high-end market	5	31.25%
Consumers' socio-demographics		
Gender		
Male	2	12.50%
Female	14	87.50%
Age		
< 30 years old	2	12.50%
31-50 years old	5	31.25%
> 50 years old	9	56.25%
Education		
< High school	5	31.25%
≥ High school	11	68.75%

Note: GAP = Good Agricultural Practice; Q-GAP = Thai national GAP; ThaiGAP = GAP standard established by Thai private sector

Source: Data from the survey

It turns out that the surveyed consumers were more middle age and elder persons because they had more time and were more willing to participate in our interview than the young ones. Most of the consumer were female since female is still the main responsibility buying food for household in

Thailand. The respondents' education levels were pretty high than the normal average because most consumers at the healthy shop and some consumers at supermarket tend to have higher education.
Given the nature of qualitative approach and non-probabilistic sample adopted, we cannot ensure that those included in the survey are representative of the overall population. Nevertheless, the survey is expected to give an overview of relevant issues and allow us to gain insights into the perception of stakeholders in Thai urban area. However, given the limited geographical scope covered by the sample, the conclusions and hypotheses drawn by means of this research are most likely to be valid just in Bangkok situation.

3.3.2 Interview procedure

Forty-eight semi-structured interviews were administered during May – June 2012. The semi-structured interview schedules were sent to respondents in advance if it was possible, except consumers. Personal interviews were conducted in Thai language and lasted approximately from 30 minutes to 1 hour. Forty-five interviews were face-to-face and three interviews were administered by telephone. The interviews were run according to a protocol (according to the tiers) to facilitate semi-structured data collection but does not strictly to them. The protocol was similar for all groups, with the exception of questions for the consumer group since we focused on their perception toward food safety certified products, not on the certification system because most of consumers are not aware of the system.

The interviewer conducted interviews as conversation-like dialogue to comfort the respondents to speak up and discuss on the topic and may also probe for further explanation. Firstly, interviewees were asked briefly to introduce themselves. Next, they were asked to express their opinion toward FSAS applied in the chain and other relevant questions. Interviews were recorded if the respondent agreed, and the interviewer took note of important information and observed context-specific elements during the interview. Immediately after the interview was administered, the interviewer prepared a summary report based on notes and on the recorded conversation, when available.

3.3.3 Data analysis

Summary reports of each interview were written in Thai immediately after conversations. A preliminary version of summary reports was submitted to the interviewees for validation in order to establish credibility of the results (Creswell and Miller, 2000; Knight *et al.*, 2007). Their comments and additional information was included into the final version of interview summaries, afterward, they were subsequently translated into English. All tape-recorded interviews were transcribed verbatim and eventually translated into English. Information from the summary reports, together with available transcription and comments were analysed through a content summarizing procedure, aimed at describing the phenomenon and at presenting the most interesting elements arising from each interview, in order to gain an extensive overview of informants' attitudes toward the topic (Downe-Wamboldt, 1992). Verbatim quotes of respondents were used to exemplify the results. The use of the symbol [...] in the quotations indicates the omission of the texts.

3.4 Results

A number of key themes in perceptions of FSAS and Q-GAP applied in the chain are shared by stakeholder groups. There are three main themes emerged: perceived usefulness of GAP standard; perceived credibility of Q-GAP standard; and opportunities and challenges for GAPs implementation in Thai fresh produce industry. This is of interest because, although stakeholders may have different perceptions and attitudes, driven by different analytical and cognitive approaches, they also express similar views as well. However, given the relatively small number of respondents participated in this study, this finding should be treated with a degree of caution.

3.4.1 Perceived usefulness of GAP standards

Majority of respondents think that GAP standards and certification are important because it is a guarantee for consumers that food are produced by good practices and certified products are 'safe' for consumption. However, each actors perceive usefulness of the standard differently with diverse intention.

Expert

Experts underline that GAP will certainly improve food safety in Thai domestic market if it is strictly implemented. In their opinion, consumers will get the maximum benefit from having less chance to be exposed to risky food and staying healthy. While producers and their families will benefit from reducing chemical products cost and having less health problems when applying good practices. Finally, application of the standard and good practices will contribute to good environment. Q-GAP is the widest GAP standard adopted by Thai farmers. Most of them think that Q-GAP could guarantee, at least, a basic level of food safety and quality; however, they do not completely trust this standard because of doubts on the effectiveness of the public sector. Nevertheless, it is supposed to be a tool to improve food safety in Thailand as a whole because all farmers can apply for Q-GAP certification for free. The fact that Q-GAP standard is free of charge is perceived by three government officers as a positive thing, since it is accessible by all farmers. Whilst an academic perceive it as a negative thing; she express that farmers may take it for granted as it is easy to obtain and is for free.

Exporter and farmer

Among actors in the supply chain, exporters are the one who perceive the usefulness of GAP standards the most. For them, GAPs (GLOBALGAP, or Q-GAP, or ThaiGAP) is "a must" since it is *de facto* mandatory[6] required by trade partners. In this case, GAPs is crucial to enter to international markets[7]. Exporters usually impose these standards to their contract farmers and provide supports and incentives for farmers to ensure that they will strictly follow the standards. In

[6] *De facto* mandatory standards are the standards promulgated by private sectors which are not legally mandated but through market transaction, these standards become mandatory in practice as they are prerequisite for suppliers who which to enter to the market (Henson, 2008).

[7] A majority of European importers requires GLOBALGAP certification; some of Thai exporters adopt ThaiGAP standard as it is acknowledged as a GLOBALGAP equivalent in May 2010; Q-GAP is a must for countries, which their governments make MOU (Memorandum of Understanding) with the Thai government e.g. the EU.

most cases, export companies organize a GAP training, provide technical support and advice, help farmers keeping record, contact certification bodies and pay for certification fee, find the market, and provide guaranteed price for farmers, etc. In addition, the exporters will control and monitor the practices closely to ensure that the farmer compile with the standards. Consequently, farmer connecting with exporters has to implement stringent GAP standards. Despite the farmer mentions that GAPs standards are complicated, time-consuming to learn and increasing paperwork (records), she is willing to do it because of high incentive and support from the exporter. This means that albeit the difficulty in changing the practices, farmers can do it if there is an adequate incentive and support from other actors.

> We use GLOBALGAP. We are nearly 100% contract farming because the standard is very high and we need completely control...We have to make sure that they compile with the standard. We will give them [farmers] a guaranteed price if they can meet our requirement. (Exporter)

> At the beginning I didn't want to do it [ThaiGAP], it is so complicated and takes time to learn. But the company [exporter] sent their staff to advise us and have orders for us regularly with a guaranteed price. I can be sure that I will have a market and I can ask for better price. Besides, it is good for my health too. So, I continue doing it. (Farmer adopting ThaiGAP)

Whilst actors from supply side in domestic markets will perceive usefulness of GAPs only if they foresee external incentives (e.g. market incentive and business profits), not internal incentives (e.g. improving efficiency of the production system to stay competitive in the long run). Most respondents underline that final consumer is the key person because their demand of safe produce will give an incentive to actors in the supply chain to adopt GAPs. Therefore, whether these actors will adopt GAPs or not, depends on their targeted consumers.

Middleman

The middleman is the most complicated group because it composes of several sub-groups -- collectors, brokers and wholesalers. Collectors and brokers are interested in Q mark and Q-GAP certification only if it is a requirement from their customers. However, when we asked if they know anything about Q-GAP certification or Q mark, most of them do not have knowledge and information of it; they just want to use it for business advantages. Some of them perceive no positive or negative effect of Q mark or food safety certification on their business because their customers do not ask for, nor have information about it.

> I decided to sell products with Q-GAP certification because it is more convenience. I have a range of customers. If they ask for a guarantee, I can give the certification to them, as they prefer. (Collector and wholesaler of GAP and non-GAP fruits)

Interestingly, two wholesale markets, who usually deal with every types of suppliers and products and tend to concern less about certification scheme, recently try to encourage their suppliers to implement Q-GAP and promote Q mark in the markets. They give the reasons that they want to create good image and to have good quality and safety products to sell in the long run. This may imply that they foresee increasing demand from consumer side so that they react in an attempt to

catch consumers' trend. Another reason maybe because they get prepare for supplying supermarket chains.

> It is a policy from our CEO to create a network of suppliers and farmers and to support them to improve quality of products so that we will have quality products sold at the market. (Wholesale market)

Retailer

Retailers who targeted consumers shopping at healthy shop and modern trade, and farmers connecting to them are more interested in adopting GAPs. This is because these consumers usually have higher education, more purchasing power and are more concern about food safety. In this case, farmers think of GAPs standards and certification as a tool to facilitate them to enter high value markets rather than to get a higher price from certified products. While healthy shop and modern trade use Q-GAP (Q mark) to guarantee food safety to their customers. This attempt is a part of their business strategy to use food safety certified products to differentiate themselves from competitor and to enhance their competitive advantage in the fierce competition of the food industry. One supermarket and one hypermarket place Q mark together with their in-house brands to introduce their brands and to impress their customers that their brands are of high quality and safety.

> We used our quality system to control freshness and sanitary of products with our "Quality" label[8]. We sell products that receive "Q mark" and our "Quality" label together to give alternatives to customer and to promote our brand. (Hypermarket)

In contrary, small retailers at fresh markets do not see the usefulness of GAPs or other food safety certification and labels. They said that their customers do not ask for it and certified products are more suitable for supermarkets' customers. Four of them mention that the supply of food safety certified products are not enough so that the products will be distributed only at modern trades. Consequently, farmers who supply this group of retailers have no incentive to adopt GAP.

> I have never sold products with Q mark or other certification because the supply of those products is very few and usually goes to supermarket, they are not enough for me. (Retailer at fresh market)

Consumer

For consumers, we ask them about their perception toward food safety certification and label, such as, "Q mark" instead of the GAP certification scheme. Consumers perceive food safety label as a guarantee that the labelled food are considered safer than the one without; however, they do not fully rely on the labels because of the lack of trust on and information about it. Albeit consumers buying food at different distribution channels are all concern of food safety (although at different levels); they have various opinions about the perceived usefulness of food safety certification and labels. Consumers buying food at healthy shops are the most concern of food safety; hence, tend to search for a guarantee (e.g. certification and labels), followed by consumers shopping at modern trades and fresh market, respectively.

[8] The respondent mentions that this label means fresh and toxic free.

Consumers shopping at healthy shops or high-end markets perceive the usefulness of food safety label and tend to use it to search for safe produce. trusted-store brand is the prominent signal of food safety for them not the food safety certification. They do not care much for Q mark since they tend to buy produce from trusted store or organic products. Nevertheless, they also have certain trust to a label written, "safe produce" even though it is only a claim without any guaranteed certification.

> When I buy fresh produce, I prefer to buy "organic" products or "safe produce". I know Q mark; however, since I usually buy organic or safe products from "Lemon Farm" or "Royal Project" stores, so I don't look for it that much. I trust more on the stores. (Consumer at healthy shop)

Consumers shopping at modern trades are more aware of Q mark and food safety issue than the ones shopping at fresh markets. Since produce sold at modern trades are mostly in the packages, the consumers get used to read labels. They usually look for expiration date, origin of products, production system, "Food and Drug Administration label[9]" and, to a lesser extent, "safe produce" label and Q mark.

> I usually look for "Food and Drug Administration label" to guarantee that at least the products compile with the standard so that I feel safer to consume them. (Consumer at Supermarket)

Since fresh produce at fresh markets usually is without packages or labels, therefore consumers shopping at fresh markets perceive no or only little usefulness of food safety labels although they also concern about food safety. Consumers in this group tend to develop relations with and trust on sellers to provide safe food for them instead. They mostly use appearance and freshness as important criteria to select fresh produce. Surprisingly, they perceive strong correlation between appearance and safety of products. They search for produce with natural defects, such as, hole or damages from pests and heterogeneity of products. In their mind, this produce is safer or farmers may use fewer chemical products. Some consumers look for seasonal and indigenous produce, and origins of products since produce grown in Thailand or developed countries is considered safer than others.

> Freshness is important for vegetables. I will also take a look if there is any natural defects, such as, damage from pest. If it is too beautiful without any defects, I am afraid that it will contain many pesticide. (Consumer at fresh market)

Finally, we found that factors affecting the consumers purchasing decision are price, freshness, appearance, quality (e.g. taste, sweetness, size, etc.), relations with sellers and service, seasonal produce, origin of products, shelf-life, package, convenience and food safety.

[9] Food and Drug Administration label or ตรา อย. is a mandatory label for food issued by MOPH, Thailand

3.4.2 Perceived credibility of Q-GAP standard

Lack of credibility of Q-GAP standard is the most important issue mentioned by most respondents, both from supply and demand sides. This contributes to the fact that, first, the whole system is carried out by the public sector under the same roof of MOAC though different departments are responsible for each tasks along the certification system. This raises the questions of accountability, transparency, independency and rigorousness of the Q-GAP's operation and enforcement. Second, the failure of the system to verify the certified products through the supply chain, result in an ineffective traceability. Third, because of the random check in the markets, faked labels and out of dated labels inevitably occur. Last, the traditional Thai fresh produce supply chain is long and complicated; there are many actors involved (i.e., farmer, local collectors, broker, processor, transporter, wholesaler, retailer), therefore, monitoring and controlling certified products through the whole chain are difficult. By the end, products are mixed up. Consumers cannot distinguish the differences between products with/without Q-GAP certification, hence, they might not buy certified products. This, in turn, does not provide economic incentive for farmers to apply good practices and leads to the situation that actors in the supply chain act as they are careless about food safety issues. In conclusion, the respondents think that Q-GAP standard has low credibility due to its structure (all activities are carried out by governmental agencies under MOAC) and performance (less stringent, slow process and inefficient verification system).

> I trust food safety certification issued by the government, however, I don't fully trust them because the inspection and monitoring system do not cover the whole chain. (Consumer at healthy shop)

All consumers express their lack of trust on food safety certification and label that currently exist in the market. Even though they state that certifications and labels make them feel safer to buy the products, they do not totally rely on them. Mostly because of the absence of information about certifications and labels, including: who is the owner of certification?; to which standard this certification refer?; and are the regulations strictly compiled? One of the element they want to be informed is the revocation of products from farmers / brands / distributors who abuse the regulations of the standards as this information is absence in the market.

> How much do I trust the certified products; it depends on the products. Sometime I didn't see differences between products with or without the certification. I feel more safe with Q mark but not that much. They should tell us what does the mark mean and which standard do they compile. Now we don't know what this mark refer to and what is the quality or safety of it. (Consumer at supermarket)

In order to avoid food safety risks, consumers have developed some strategies, for instance, trust on store brands (e.g. "Lemon Farm", "Santi Asoak" which are healthy shops), private brands (e.g. "Doi Kham", "Doctor's Vegetables"), distribution channels (e.g. healthy shops and supermarket chains), regular sellers (in case of fresh markets) and origin of products (a majority of consumers think that local production is safer than imported products from neighbour countries). They indicate that they trust these brands or persons more than the public certification because they are in the business and have a reputation to maintain. This may imply that in their mind private firm/person more efficiently control food safety than the public sector.

> I don't care so much for food safety labels, I trust more on Doi Kham brand [private brand]. This brand has good reputations for many years and these products are more expensive than others. (Consumer at high-end market)

> I buy fresh vegetables from regular shops because I can ask them where do the vegetables come from. Direct sale from farmers is good too. I prefer indigenous vegetables because they grow naturally and they are safer. (Consumer at fresh market)

3.4.3 Opportunities and challenges for GAPs implementation in Thai fresh produce industry

Opportunities

A majority of respondents indicate that the increasing of consumers' awareness of food safety is the great opportunity to improve GAPs and other food safety assurances implementing in Thailand; although it is currently only in Bangkok and urban areas. The enthusiasm of private firms (e.g. high-end markets, healthy shops and modern trades) to use GAPs as a marketing tool is also a plus, according to the experts' point of view. Three government officers add that the government's food safety policy correspondingly to the policy "Thai Cuisine to the World[10]" is the good condition to improve FSAS, including GAPs. In addition, two experts from international organization mention that an attempt of authorities to separate responsibilities and to involve third party certification into Q-GAP procedure will certainly improve credibility of Q-GAP certification. Furthermore, all experts and some big distributors underline that joining with the AEC in 2015 will motivate Thailand to develop more effective food safety assurance system to gain competitive advantages in the markets.

> I think consumers are more concern on food safety issue than before. Nowadays farmer and retailers who can differentiate himself from others through GAPs will have higher opportunity to receive higher margin than the others. (Expert from international organization)

> Thailand is just awakened to implement GAPs when we knew that we are going to join with the AEC. We should push GAPs to be a basic standard for the production so that we will not have a problem of trade barrier. (Hypermarket)

Challenges

The most challenging issue for GAP application in Thailand is the low awareness of food safety among stakeholders in the supply chain (although it is increasing but still considered as few); resulted in an absence of consumer demand for safe produce, and a perceived uselessness of the certification in producers' and distributors' minds. At the same time, the incredibility of the system also threatens consumer trust toward the certification and brand. Interestingly, several respondents mention that problems of food safety are mainly because of the lack of ethics. They underline that producers and distributors should concern about what they produce and distribute because those products will have impact on consumers' health. They add that no matter how strict the regulations are, if people do not have ethics, the regulations cannot control those anyway.

[10] 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 favorite 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)

> As I has worked in retailer business for 8-9 years, Thai consumers do not care much about food safety. They concern more on price and freshness, except the consumers who consume bio-organic foods but they are few. (Hypermarket)

The shortage of knowledge and information in all tiers, including in authorities' group, are underlined as a great hindrance to develop efficient systems, to promote good practices, and to improve consumer demand for certified products. The development of traceability and monitoring technology, and technology transfer are also challenging. Notably that characteristics of fresh produce, which are highly diversify, perishable, and quality determination, make it more difficult to handle than other industrial products.

Discontinuity of the food safety policy and the bureaucratic system of the governmental authority hinder the development of GAP standard as well. In addition, GAP is still a voluntary standard and there is no legally consequences or economic disadvantages from abusing the standard; hence, farmers may not strictly implement it.

> GAP is still a voluntary standard. When it is a voluntary, nothing is going to happen. Some farmers said that there is no laws to regulate their practice so they don't need to change anything. I have to find another law that regulate a final product to force them to implement GAP. (Hypermarket)

3.5 Discussion

The respondents agree that GAPs is useful and could be used as a tool to control and monitor food safety in the supply chain. However, the lack of credibility of national GAP or Q-GAP standard is the most crucial aspect mentioned by most respondents. They perceive, particularly, Q-GAP as a basic reference for food safety, at the same time, they doubt the trustworthiness of the certification scheme as it is carried out solely by the government authorities and the traceability system does not function effectively. This contributes to the fact that food safety attribute is a 'credence attribute' that consumers cannot verify it by themselves. Hence, they have to lie their 'trust' on the medium, in this case, the certified certification body (e.g. Caswell, 1998; Roosen, 2003). In case of Q-GAP, the certified body is the governmental authority which possess certain trust from consumers. However, there is also an expression of little trust in the government's handling of designing the system, controlling, monitoring and inspecting the farms. This might be a result of distrust in the process of government institution dealing with food safety issues and the results of the food illness outbreak in the past (Kjærnes, 2006; van Rijswijk and Frewer, 2008).

From the managerial point of view, we did not find the connection of FSAS along the chain, from production to distribution to final consumers (e.g. from GAP to GMP/HACCP and GMP/HACCP to Q mark label). This situation happens because all stakeholders (i.e., farmers, collectors, wholesalers and retailers) in the supply chain do not participate in the FSAS scheme, therefore, it is hard to control and monitor the safety of products from one tier to another tier, this, in fact, has been highlighted by the respondents. At the same time, most of respondents highlight the lack of conscious, awareness, knowledge and information regarding food safety as the main hindrances for GAP or any FSAS adoption in Thai fresh produce supply chain.

The respondents who are experts suggest some actions to improve the credibility of Q-GAP, for instance, to strictly enforce the standard regulation and to split the inspection and monitoring tasks to third party certified body. This is in accordance with the literatures that control and monitoring by independent certified body could improve accountability of the certification system (e.g. Grolleau and Caswell, 2006; Jahn *et al.*, 2005; Roosen, 2003). Recently the MOAC has been trying to outsource the inspection tasks to third party firms in order to cope with this issue but it is still in the initial stage. The traceability system is also mentioned as an important tool to help consumers to distinguish between certified and non-certified products. The credibility of the standard together with an efficient traceability system may be able to increase consumer trust and willingness to pay for the certified products. This, in turn, compensates to producers who implement good practices; hence, provide them an economic incentive to continue adopting GAPs.

The respondents also express that governmental authorities or the independent agency should be in charge of the implementation and control of food safety assurance system as they believe that it is their task to guarantee food safety for the society. The second most preferred responsible for them are producers as producers should provide food in the ethical way. In addition, they mention that governmental authorities should be response for providing and disseminating relevant information about food safety and reveal opportunistic behaviour in the market to the public as this information is missing and they think that this information is significant to establish the credibility of the food safety system at domestic markets.

Most respondents indicate consumer demand as the most important factor that will drive the market of food safety certified products. However, there are few demand for products with food safety label, mainly only in urban areas. The lack of demand for food safety labelled products in the market contribute mainly to the lack of credibility of the standard and labels, lack of information provision regarding food safety and labels, and confusing about several brands and labels existed in the market. This conformed to the previous study (e.g. Jahn *et al.*, 2005; van Kleef *et al.*, 2006) that the effective food safety management system is closely related to how the system is developed and maintained and controlled and the communication with consumers about the system and the performance of the system. In our study, surveyed consumers stress that there is a need to control provide effective communication about food safety and labels to the public.

Currently FSAS is not trustworthiness and food safety and quality are not easy to identify at the sale point, therefore, Thai consumers intend to rely on extrinsic cues such as freshness, appearance, trust on sellers or brand stores or private brands instead of the certification. Nevertheless, the consumers shopping at healthy stores and modern trades seems to be the potential consumers for food safety certified products. The surveyed consumers shopping at healthy shops are interested in food safety certified products the most; they also express their stated willingness to pay higher price for 'trusted' certified products. Notably, they trust the store brand rather than the food safety certification, nevertheless, they feel that having a certification is better than not having it. Whilst consumers at modern trades express less interest than the previous groups, however, they get accustomed to Q mark and other safety labels already. The consumers at fresh markets do not show much interest in Q mark or other sources of food safety certification and labels since products sold through this channel are mostly without packages.

Among distributors, the modern trade is the most enthusiasm group in distributing food safety certified products. They start to impose their suppliers to implement, at least, Q-GAP as a marketing tool to create good image as food safety provider and to create consumer trust on their brand stores. Therefore, most experts believe that the modern trade could be an important channel to distribute food safety certified products. At the same time, the wholesalers seem to be interested in providing Q mark products as well. This may be because they foresee a consumers trend and they are getting prepared to provide supply for modern trades. They even offer themselves to be a mediator between government authorities and producers. The government or stakeholders may consider to input information about food safety and standard to this actor and let them disseminate information since they are in touch with a wide range of producers. This might be faster and more efficient than only rely on few retailers or exporters (Granovetter, 1973). On the contrary, collectors and small retailers in fresh markets are not interested in Q mark products unless there is customers' demand. As distributor groups have strong bargaining power in the chain, hence, they are able to influence the decision of producers and suppliers to adopt/non adopt GAP. Therefore, it might be more efficient to control food safety through these distribution channels rather than monitoring only at farm level.

The results suggest that although producers perceive GAP implementation as a complicated system and time consuming to learn and keep recording, they are able to do it if there is enough motivation. The main motivation for producers to apply GAP standards is the economic incentive: the increase of consumer demand for safe food; the possibility to enter the high-end markets; and added-value to products to get premium or guaranteed price. We also find that the connection with exporter is the key factor influencing producers' adopting decision which conforms with previous studies (e.g. Kersting and Wollni, 2012; Kleinwechter and Grethe, 2006; Souza Monteiro and Caswell, 2009; Sriboonchitta *et al.*, 2008). Moreover, it is more likely that the exporter and modern trade will prefer contract farming over the traditional business relationships due to the ability to monitor and control food safety and quality through the contract. In the near future, this might change the way of fresh produce production in Thailand. Nevertheless, the majority of Thai producers are small holders, hence, one of the options could be forming a producer group to organize the internal control before being inspected by the external party. Albeit a little trust on the system, most respondents think that Q-GAP would be useful to improve food safety in Thai domestic market at the production level because it is the only standard that small farmers can apply without bearing any certification cost. Although some respondents think that farmers may take it for granted as it is costless, this issue is considered by some respondents as a strength of the standard because all farmers can adopt it without cost hurdle. The same result is found in the study of Schreinemachers *et al.* (2012) that the Thai producers thinks that free of charge of Q-GAP is the main strength. Nevertheless, they also mentioned that the strict enforcement is urgently required.

3.6 Conclusions and Future Research

As a final remark, we point out that our results suggest that consumer is the key actor in developing GAP implementation in Thailand whilst the modern trade is the main driver in Thai domestic market as it has highly influence in producer's adoption and implementation. Wholesaler may be an alternative actor where governmental authorities can disseminate information and connect with a wide range of producers. The national GAP or Q-GAP is the most promising standard which could be reached by all small farmers, however, the improvement of the credibility of the system and the enforcement of the regulation are crucial and urgently required. Finally, the results may be used as relevant information for policy makers and industries in order to find appropriate strategies to sustain the GAPs in Thailand.

As the respondents in this study are mainly from Bangkok and vicinity, therefore, the results imply only the situation in these areas and cannot be generalized to the picture of Thailand as a whole. Given the nature of qualitative exploratory research, we cannot give conclusive results or generalize to the whole industry but the results can be served as input for further research in this research topic. For instance, what is the consumers' perception of food safety and what are the signals they looking for; which types of information should be provided for consumers?; what are consumer preferences and willingness to pay for food safety certified products?

Appendix 3.1 Semi-structured interview protocol – Expert

Topics of interest	Questions
1. Characteristics of Interviewee's business	Could you please explain what are the main characteristics of your business? How long is your experience in this business, also in other companies/activities? Could you please tell us something about your network and relationships in the industry?
2. Degree of involvement and familiarity with Food Safety Assurance System (FSAS)	What come to your mind when I mention food safety assurance system (FSAS)? In case you know it, what is your general opinion about this system? Are you aware of cases of FSAS adopted in Thailand? What do you think about the implementation of FSAS in Thailand (system, enforcement, credibility, and other issues...)? ✓ What are the strengths/weaknesses of Thai FSAS in your opinion? ✓ What are the trend of FSAS development in Thailand? ✓ What are the potential/barriers of FSAS development in Thailand? What is the role of stakeholders in the chain: public sector, private sectors, farmers, processors, distributors (wholesalers and retailers), and consumers, in the development of FSAS in Thailand?
3. Attitude toward FSAS for fresh produce products	How is the situation of FSAS of the supply chain of fresh produce in Thailand? Does fresh produce represent a special case for the implementation of FSAS? If yes, why? What do you think about FSAS for fresh produce, such as Q-GAP, Thai-GAP, Global GAP? How do you compare them with other general purpose FSAS such as GMP, HACCP, and Traceability?
3. Attitude toward FSAS for fresh produce products (continue)	Do you think FSAS could enhance the confidence about food safety in fresh produce products among *practitioners*? Do you think FSAS could enhance the confidence about food safety in fresh produce products among *consumers*? Do you think FSAS labels may add value to fresh produce products? Are labels of FSAS an advantage for producers or suppliers to get listed from wholesalers/retailers? Do you think that FSAS certification may be an important attribute which wholesalers/retailers take into consideration when selecting the business partner? How do Thai consumers perceive FSAS labels (e.g. Q mark) on fresh produce products? ✓ Do they recognize the FSAS labels? ✓ Do they understand the FSAS label? Do you think that FSAS certification may be an important attribute which Thai consumers take into consideration when purchasing products? Why?
4. Factors influencing FSAS adoption in the supply chain of Thai fresh produce and the barriers	Do you think what are the reasons why companies and producers *should adopt* FSAS for fresh produce? (to fulfill requirement of foreign partner, requirement for contract farming, they get supports from the government, average farm price, being a progressive farmers, etc.) Do you think what are the reasons why the company and producer who should adopt FSAS *did not* adopt it? (difficult to implement, do not have knowledge, high implementation cost, low credibility of the system, etc.) What are the level of FSAS implementation in Thai fresh produce industry? Why? What are the main hindrances of FSAS adoption in Thai fresh produce industry?

Appendix 3.2 Semi-structured interview protocol – Producer

Topics of interest	Questions
1. Background and farming system	How long have you been in fresh produce production? Has the farm been always a fresh produce farm? What type is your production system? (monocrop, rotating crop, IPM or integrated pest management systems...) Which are your main crops? Do you produce crops independently or do you have a contract farming? Who are your main business partners? (buyer/collector, cooperative, wholesaler/retailer, exporter) Have you ever participated in any farmers' groups, associations, extension programmes and other organizations? Have you ever got any support from government/firms/academic sector/consultants?
2. Degree of involvement and familiarity with Food Safety Assurance System (FSAS) and factor affecting FSAS adoption, focusing on Good Agricultural Practice (GAP)	Are you aware that the Thai government is promoting "Food Safety Assurance System (Q-GAP)"? or other programmes e.g. Thai GAP or Global GAP or Traceability? Do you participate in any GAP programmes (Q-GAP/Thai GAP/Global GAP)? Where can you find information about GAP or other food safety assurance system? Have you ever adopted any quality or food safety assurance system to your crop production? If so, ✓ When do you start adopting GAP or other FSAS? ✓ What are the reasons why do you adopt GAP? ✓ What is the main product? ✓ Do you have any comments on the adoption, may it be benefits or drawbacks? ✓ What is the response of collectors/distributors/customers to products with FSAS labels? ✓ Did you get any support from the government/firm/academic sector? How do they support you? If not, what are the reasons why you did not adopt it ?
3. Perception and Attitude toward FSAS certifications for fresh produce products focusing on GAP	What are your perceptions about the potential benefits and constraints of GAP? Do you think that collectors/distributers/exporters may be interested in fresh produce with Q labels or not? Are labels of Q mark an advantage for you as a producer to get listed from collector/distributor/exporter? Do you think that consumers may be interested in fresh produce with Q labels or not? Do you think Q mark or food safety certification may add value to fresh produce? How can stakeholders (government, private sector/ academic, etc.) enhance the FSAS adoption in the Thai fresh produce supply chain?

Appendix 3.3 Semi-structured interview protocol – Distributor

Topics of interest	Questions
1. Characteristics of Interviewee's business	Could you please explain what are the main characteristics of your business? How long is your experience in this business, also in other companies/activities? Could you please tell us something about your network and relationships in the industry?
2. Degree of involvement and familiarity with Food Safety Assurance System (FSAS)	What come to your mind when I mention food safety assurance system (FSAS)? In case you know it, what is your general opinion about this system? Have you ever distributed products with FSAS certification (e.g. Q-GAP or Thai GAP)? or Do you know companies producing/distributing products with this certification? If so, Why? ✓ What is the main product? ✓ What is or could be, in your opinion, the response of consumers to products with FSAS labels? ✓ What kind of image do these products have in the eye of consumers? How do Thai consumers perceive FSAS labels (e.g. Q mark) on fresh produce products? ✓ Do they recognize/understand the FSAS labels? ✓ Do you think that FSAS certification may be an important attribute which Thai consumers take into consideration when purchasing products? Why? If not, what are the reasons why you do not distribute them?
3. Expectation and requirement for fresh produce products	*for you* as a distributor, what are the important purchasing factors concerning fresh produce products? What are your expectations on quality parameters and requirements for these products (e.g., safety controls, product performance in terms of freshness, appearance, shelf-life, certifications, timeliness and regularity of supply, trust, etc.)?
4. Attitude toward FSAS certifications for fresh produce products	What do you think about the implementation of FSAS of the supply chain of fresh produce in Thailand (system, enforcement, credibility, and other issues...)? ✓ What are the strengths/weaknesses of Thai FSAS in your opinion? ✓ What are the trend of FSAS development in Thailand? ✓ What are the potential/barriers of FSAS development in Thailand? Do you think FSAS labels may add value to fresh produce products? Do you think FSAS could enhance the confidence about food safety in fresh produce products among *practitioners*? May FSAS labels represent a competitive advantage for producers or suppliers to get listed or be preferred by wholesalers/retailers/exporters?

Appendix 3.3 (Continue)

Topics of interest	Questions
5. Factors influencing FSAS adoption in the supply chain of Thai fresh produce and the barriers	In your opinion, what are the reasons why companies and producers *should adopt/should not adopt* FSAS for fresh produce? What are the main hindrances of FSAS adoption in Thai fresh produce industry? In case companies and producers who should adopt FSAS *do not* adopt it, what are the reasons why? What are the level of FSAS implementation in Thai fresh produce industry? Why? How can stakeholders (government, private sector/ academic, etc.) enhance the FSAS adoption in the Thai fresh produce supply chain?
6. Opinion toward fresh produce products with FSAS labels and the potential products	What is the potential for fresh produce with FSAS labels, in your opinion? What are the marketing strategies/measures you would suggest to increase the sales of fresh produce with FSAS labels?

Appendix 3.4 Semi-structured interview protocol – Consumer

Topics of interest	Questions
1. Fresh produce Purchasing and preparation behaviour	Where do you usually purchase fresh produce? What are the important purchasing factors for you concerning fresh produce (freshness/taste/quality/price/safety)? Do you look at labels? What kind of information you look at? How did you prepare dishes with fresh produce?
2. Knowledge with regard to food safety	What come to your mind when I mentioned 'food safety' Which are the main source of information about 'food safety'? Which aspect of food safety do you concern on fresh produce (chemical residues, pathogens contamination, heavy metal contamination, GMOs)? Have you ever personally experienced an issue with food safety in fresh produce?
3. Trust and confidence on food safety of fresh produce in the market	How safe would you consider fresh produce at fresh market/supermarket? How do you decide whether a source is reliable?
2. Knowledge with regard to food safety certifications	What come to your mind when I mention 'certification'? Which are the main source of information about 'food safety certification'? How do you decide whether a source is reliable? Have you ever purchased 'safe' fresh produce? ✓ If so, why?, how often?, what are the main products? how do you know it is a safe product? ✓ If not, why? Are you aware of any food safety certification and labels (e.g. Q mark)?
4. Attitude toward "food safety certification and labels" on fresh produce	Do you think certification is useful? Does a quality/safety label delivers useful information to you? Which one do you trust the most (from the government/private ones/ international ones)? Do you think food safety labels could enhance the confidence about food safety in fresh produce products for you or not? Would you be willing to pay more for a fresh produce with food safety labels? If so, why? If not, why? Do you think how can stakeholders (government, private sector/ academic, etc.) improve your confidence on food safety of fresh produce? In your opinion, who is in charge for checking and ensuring safety for fresh produce?

CHAPTER 4

CONSUMER PREFERENCES AND WILLINGNESS TO PAY FOR FOOD SAFETY LABEL ON FRESH PRODUCE: CHOICE EXPERIMENT WITH THAI CONSUMERS

Abstract

Food Safety has been concerned as a prominent issue in Thailand for a decade. Food Safety labels (i.e.., Q mark from the Ministry of Agriculture and Cooperative) have been introduced to the market in order to assist consumers to recognize safe products, particularly fresh produce that is the main concern of Thai consumers. However, there is no clear evidence on the value Thai consumers place on the labels and this is reflected in the reluctance of the fresh produce industry and particularly producers to comply with regulations to obtain certification and label. This contributes to hinder the development of a market for safe 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" and for the industry to compete in the ASEAN Economic Community in 2015. This study is aimed at estimating the value Thai consumers place on food safety labels for fresh produce using a discrete choice experiment. The primary data has been collected through a survey aimed at eliciting consumers preferences and willingness to pay (WTP) for Chinese cabbage, trading off between different types of food safety labels and private brands, price, and freshness. A sample of 350 Thai consumers took part in the survey administered at different locations in Bangkok in July 2013. Multinomial Logit (MNL) and Random Parameter Logit (RPL, also known as Mixed Logit) regression models were used to analyse the data. Results suggest Thai consumers are willing-to-pay a premium price for food safety labelled produce over unlabelled ones; however, having any certification is indifferent for them. Freshness, price, and brand are all considered as relevant attributes by consumers. We conclude discussing the implications of our findings for businesses and policy makers.

Keywords: Food safety label, choice experiment, consumer preference, Thai market, fresh produce, stated preferences

4.1 Introduction

Food safety scares (such as, mad cow disease, dioxins, avian flu, melamine contamination and *Escherichia coli* outbreaks) have raised awareness about food safety issues among consumers. The series of food scandals not only deteriorate consumers' confidence on food safety, but also threaten sustainability of food industry and trades. Usually, when consumers learn of a food safety incident and the possibility that certain food is unsafe, they might simply stop consuming that type of food; hence, the specific food sector is heavily damaged (Mazzocchi *et al.*, 2008). This is due to the fact that food safety is considered by consumers as "credence attribute", which is a characteristic concerned by consumers but are not accessible in the process of buying and consuming (Nelson, 1970; Olson and Jacoby, 1972). Therefore, consumers are not able to know whether products they are going to buy and consume are safe (Becker, 2000; Caswell, 1998; Loader and Hobbs, 1999). Consequently, consumers tend to look for the guarantee to reassure them that the products are safe

in term of brand, information and quality assurance to reduce the perception of food safety risk, especially during a period of food scares (Yeung *et al.*, 2010). In the situation of food scares , the certification and label are used as means to verify the credence attribute and signal consumers that the certified product is qualified; hence, allow market to function better (Caswell, 1998; Giannakas, 2002; Jahn *et al.*, 2005). Certification transforms credence attributes into search attributes for consumers allowing them to evaluate product safety before making a purchasing decision. Hence, food safety certifications and labels are one of the tools used by several governments and firms to cope with food safety issues in the supply chain (e.g. Caswell, 1998; Golan *et al.*, 2004; Hammoudi *et al.*, 2010; Henson and Humphrey, 2009).

In Thailand, however, most of standards and regulations are weakly enforced in the domestic market comparing to exported products, which are more strictly controlled by importer regulations and voluntary private standards (e.g. Global GAP in the EU) (Oates, 2006; Takeuchi and Boonprab, 2006). The Ministry of Public Health reported that 1.4 million Thais suffered from diarrhea, about 100,000 from food poisoning, 14,000 from dysentery, and 279 from cholera in 2011 (Foreign Office, 2012). Food safety scandals still remain a prominent issues in domestic markets, especially scandals related to chemical residues on some fresh produce (e.g. Chinese Kale, chilli and cabbage), outbreak of *Clostridium botulinum* contamination in home-canned bamboos shoots. As a result, Thai consumers have increased awareness on the importance of food safety controls and some of them are now more demanding when it deals with quality and safety of food products, especially in the urban area (e.g. Gorton *et al.*, 2011; Lippe, 2010; Lippe *et al.*, 2010; Posri *et al.*, 2006; Roitner-Schobesberger *et al.*, 2008; Takeuchi and Boonprab, 2006).

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 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, 2011b)]. Subsequently, in 2005, ACFS established a voluntary food safety label named "Q mark[11]" as an attempt to reach 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 (Lippe, 2010; Vanit-Anunchai, 2006; Vanit-Anunchai and Schmidt, 2006). Currently, Q mark is one of the dominant food safety labels 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 (Gorton *et al.*, 2011). So, a majority of consumers are not aware of or understand the meaning of this label. Moreover, quality of products (in term of appearance and freshness) and price are still the main factors affecting fresh produce

[11] 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 (Good Agricultural Practices) standards and be certified by the certification body (CB); the production process and post-harvest activities (e.g. pack house facilities) has to conform to GMP (Good Manufacturing Practices) or HACCP (Hazard Analysis and Critical Control Points) 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.

purchasing decision of the consumers, although food safety has been growing important lately (Gorton *et al.*, 2011). 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 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[12]" and for the industry to compete in the ASEAN Economic Community in 2015.

In order to address the market and policy concerns related to food safety labelling policy, policy makers need additional information on Thai consumer preferences to understand the relative value of food safety label, compared to existing brands, as well as other important fresh produce quality attributes. Thus, the social desirability for food safety label could be revealed to aid policy makers in drafting and implementing more effective food safety regulations and label and restoring consumer confidence. Furthermore, the study on consumers' preferences and willingness-to-pay (WTP) for different attributes of fresh produce (e.g. price, freshness, brand and label) 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; Enneking, 2004; Loureiro and Umberger, 2007; Olynk *et al.*, 2010; Ortega *et al.*, 2011; Rozan *et al.*, 2004; Tonsor *et al.*, 2009b). Relatively little consumer research exists assessing Thai consumers preferences for food safety labelling[13]. 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 twofold: (1) determine value Thai consumers place on 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 use information gained from this study to provide useful information for policy makers on food safety label policy and to guide future management and marketing strategies for the Thai fresh produce industry.

[12] 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 favorite 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)

[13] 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).

4.2 Methodology

The survey instrument was designed to elicit consumer preferences regarding food safety label on fresh produce in the hypothetical situation. In order to elicit consumers' preferences a choice experiment framework was used, which allowed individuals to select between three alternative options, two types of Chinese cabbages that contained the relevant attributes at different levels, and a opt-out option (no purchase option). In addition to question related to preferences for food safety labels, perception toward food safety and socio-demographic information was collected from each respondents.

Although there are several techniques that could be employed to measure WTP, we chose to use a discrete choice experiment because it is the most widespread technique used to elicit WTP of consumers for food attributes (e.g. Alfnes, 2004; Burton *et al.*, 2001; Loureiro and Umberger, 2007; Rozan *et al.*, 2004), particularly in situations where market data are non-existent or unreliable (Tonsor *et al.*, 2009b). 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[14] (Alfnes *et al.*, 2006; Lusk and Hudson, 2004; Neill *et al.*, 1994; Yue and Tong, 2009), a problem that is common to all the WTP elicitation techniques that rely upon stated preferences and that could be limited by using cheap talk[15] before the experiment (Silva *et al.*, 2011).

4.2.1 Choice experiment design

Attributes and levels

Moser *et al.* (2011) reviewed fruit and vegetables attributes concerned by consumers and found that consumers in Eastern Asia/Pacific Rim region have preferences for health and environment attributes, visual and smell components and pesticides, while price remain an important factor although it was not mentioned directly. They mentioned that brand and certification are not considered so much in the previous research studies in this region. Whilst Shepherd (2006) reported that in Asia the main factors influencing decision to buy fresh produce at the point of sale are presentation, appearance, colour, uniformity, ripeness and freshness. Since many consumers decide what to buy only when they arrive the store, thus appearance is one of the most important factors affecting purchases. Price and convenience of the retail outlet location are important as well. The studies on Thai consumers' behaviour revealed that Thai consumers concern freshness as an important factor when they decide to buy fresh produce (Gorton *et al.*, 2009; Lippe and Isvilanonda, 2010).

Finally, the attributes freshness and price were selected based on the results obtained from previous research studies regarding the attributes preferred by consumers and their WTP for these attributes,

[14] Respondents might overstate WTP in the hypothetical situation due to the lack of incentive to state the real amount.

[15] 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 by simply making respondents aware of it regardless of its underlying cause.

together with results from the researchers' qualitative survey in 2012. Attribute 'brand & label' was added in this research as it is attribute of our interest. 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 concerned 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 Claimed[16] "Safe Produce (ผักปลอดสารพิษ)" and private brands (i.e. Royal Project "โครงการหลวง" and Doctor's Vegetables "ผักด็อกเตอร์") are included in this study due to their existence and importance as brand and label related to food safety in the market. Hence, the choice experiment design comprised three attributes, namely: price, freshness, and brand & label. The attributes varied with three to five levels.

- Prices covered by the four equi-spaced price levels (average retail price, -50%, +50%, +100%) were chosen to reflect the range of market prices for one kilogram of Chinese cabbage at the time of the study in June 2013 (The average price was 50 baht/kg). The fixed price was selected under the assumption that utility is linearly related to price. Note that this wide range of prices could be found in the Thai market in the different market channels.

- Freshness referred to days after harvest (0 day, 1 day and 2 days). Since freshness is the representative attribute of the product appearance, pictures were used to illustrate products appearance. The pictures were used instead of using the real products to avoid bias that might occur if the cabbage samples look different among places and times during the survey.

- Brand and Label attribute comprise 5 levels: (1) "No information" which is status quo or the present situation in the market since currently most of products has no package except some in supermarket chain; (2) Labels claimed "Safe Produce" ("ผักปลอดสารพิษ") which means the practices and processes used and all claims made by the product label have been verified by the farmer and/or distributors themselves, it is widespread throughout the market; (3) "Q mark" or Q-GAP, which is the main food safety label in the market approved by the National Bureau of Agriculture Commodity and Food Standard (ACFS), the Ministry of Agriculture and Cooperatives (MOAC); (4) "Royal Project" ("โครงการหลวง"), which is the brand set up by the Royal Project Foundation and is renowned for the strictly regulated production with good agricultural practices (Q-GAP) and post-harvest and is perceived as supporting small farmers in Thai rural areas (Isvilanonda, 2006); and (5) " Doctor's Vegetables" ("ผักด็อกเตอร์"), which is one of the pioneer private firm providing safe fresh produce and all products are certified with Q-GAP from MOAC. These two private brands are among the most well-known fresh produce brands in the market and are considered as high quality and safety brands. Note that most of the products from these private brands obtained Q mark; thus, in order to make the simulated shopping situation credible, Q mark always appeared together with the private brands in this experiment

Table 4.1 shows the attributes and attribute levels evaluated in the choice experiments. Besides the attributes listed below, each product possesses the same characteristics (e.g., similar colour and size).

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

Table 4.1 Attributes and levels of fresh Chinese cabbages used in the choice experiment.

Product attribute	Attribute level
Price	25 baht/kg
	50 baht/kg (Average 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

Note: Thai baht (BHT). In July 2013, 1 BHT = 0.032121US Dollars.

Experimental design

The main effect was employed to select choice situations (Lusk and Norwood, 2005; Olynk *et al.*, 2010). Ngene 1.1.1 software (Choice Metrics, 2012) was used to design an efficient or D-optimal design[17]. In order to do so, it was necessary to obtain priors[18] for each attribute. Jaeger and Rose (2008) discussed that it is sufficient to give just the negative or positive sign to the prior; hence, in this study, the signs of priors were given as follow: price (-); freshness 0 day (+); freshness 1 day (-); freshness 2 days (-); brand & label (+). Multinomial logit design with D-error measure was applied. Effects coding[19] was used in the design and model, to avoid confounding effects of attribute levels which are baseline with the constants of the model like in dummy coding (Bech and Gyrd-Hansen, 2005). The following utility function was used in the design:

$$U = f\{\text{Price, Freshness, Brand and Label, } \varepsilon\} \quad (1)$$

where *Price* is the price for 1 kg of Chinese cabbage; *Freshness* and *Brand and Label* are effect coding variables taken the value +1 if the product has respectively freshness levels or label & brand levels, -1 if it is in base categories (freshness today and no information), and 0 otherwise.

[17] 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 or AVC matrix) (Jaeger and Rose, 2008). This results in improving the reliability of the parameters estimated from data at a fixed sample size and reducing the sample size required to produce a fixed level of reliability in the parameter estimates with a given experimental design. Therefore, when the D-error is low the statistical efficiency is high. However, the problem with this type of design is that the prior parameters value is needed to be set since the beginning, in order to calculate D-error.

[18] A prior provides information on how the model parameter in question influences choice when all other parameters are held constant (Jaeger and Rose, 2008). A positive prior indicates that relative to the reference level for the attribute, the attribute will positively influence (i.e., increase) choice probability. A negative prior indicates that relative to the reference level for the attribute, the attribute will negatively influence (i.e., decrease) choice probability.

[19] Effect coding is a code that can be used for categorical predictor variables. The attributes will take a value of 1 when applicable, a value of -1 when the base category applies, and zero otherwise (Olynk *et al.*, 2010; Tonsor *et al.*, 2009a).

The final design was chosen as the one, which among evaluated designs (iterations) had the lowest D-error. The final design had a D-error of 0.2090 and comprised of 12 choice situations with 2 unlabelled cabbage alternatives and "opt-out" or no purchase[20].

4.2.2 Survey procedure

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 *et al.*, 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 10-15 minutes.

The questionnaire was pre-tested on 60 respondents in Bangkok (40 respondents at a fresh market and 20 respondents at a supermarket). The outcome of this pilot test was used to improve the clarity of the questions and to test the model specification. 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. Each of the cabbage products was described and presented to respondents in terms of three attributes (price, freshness, and brand & label) at different levels.

Prior to the choice experiment 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 4.1). The choice questions were presented in randomized order across respondents to mitigate 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.

[20] "Opt-out" option or no purchase option is included to imitate the real shopping situation where consumers may decide not to buy any available choices (Adamowicz *et al.*, 1998; Gao and Schroeder, 2009; Loureiro and Umberger, 2007; Lusk and Schroeder, 2004).

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 4.1 An example choice scenario included in the choice experiment.

4.3 Theory and Empirical Model

4.3.1 Conceptual framework: choice experiment

In a choice experiment, respondents are asked to choose their preferred alternative amongst hypothetically constructed scenarios, where each scenario is a function of different attributes of product (including price) and each attribute varies at different levels. By observing the changes in respondent stated choices with variation in the scenarios, the effect of the attributes on the choices can be derived.

Choice experiments are based on the Lancaster theory of consumer choice (Lancaster, 1966), which assumes that utility of a goods can be segregated in utility of different attributes of a product and consumers make choice based on preferences attributes of the goods. Because goods are made up of attributes, the total utility gained from a product or service is the sum of the individual utilities provided by the attributes of that good. Hence, consumers' choices are determined by the combinations of product attributes. In this way, utility is derived from the attributes and attribute levels of product. During the choice-making process, consumers make trade-offs between different attributes and attribute levels (James and Burton, 2003). Choice experiments are also based on random utility theory (RUT) which was originally proposed by Thurstone (1927) and was extended by McFadden (1974). RUT posits the existence of a latent construct (unknown part or random term), that underlies choice behaviour, in the utility function. The assumptions of RUT are that decision makers or consumers are rational; and they make choices to maximize their utility subject to their budget constraint.

The assumption of the choice experiment modelling are as follow: alternatives are exhaustive; alternatives are mutual exclusive; and the number of alternatives is finite (Train, 2009). According to RUT, consumers are assumed to be rational to evaluate all alternatives before choosing the alternatives from which they are expected to derive the greatest relative utility (utility maximizers).

They know their utility received from each choice; on the other hand, their utility are not completely known by the researcher. For the researcher, utility of consumers *i* obtains from alternative *j* is decomposed into a deterministic part which is known by the researcher up to some parameters, and an unknown part that is treated by the researcher as random. The random utility function (U_{ij}) as the *i* consumer's utility of choosing option *j* is:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (2)$$

where V_{ij} is the deterministic component and ε_{ij} is the stochastic error. When a consumer *i* is facing a choice set, C*i*, consisting of *J* options, the choice probability of choosing alternative *j* is equal to the probability that the utility of alternative *j*, U_{ij} is greater than or equal to the utilities of all other alternatives in the choice set. Thus the probability that consumer *i* choose alternative *j* is given by:

$$Prob_{ij} = Pr(U_{ij} \geq U_{ik} \text{ , for all } k \in C_i \text{ with } k \neq j) \quad (3)$$

$$Prob_{ij} = Pr(V_{ij} + \varepsilon_{ij} \geq V_{ik} + \varepsilon_{ik}, \text{ for all } k \in C_i \text{ with } k \neq j) \quad (4)$$

Since the researcher does not know ε_{ij}, therefore, treats this term as random. Different choice models can be derived depending on the different assumptions about the distributions of the unobserved portion of the utility ε_{ij}. In this study, multinomial logit model (MNL) and random parameter logit model (RPL) were applied.

4.3.2 Econometric models

Multinomial Logit model (MNL)

McFadden (1974) multinomial logit model is the most traditional model used in choice experiments due to its convenience in the calculation. Consumers are assumed to be homogenous in taste among population. This model also assumed that random errors (ε_{ij}) are independently and identically distributed (i.i.d.) in which each random variable has the same probability distribution and all are mutually independent. That means all random variables have the same mean and variance. The probability of consumer *i* choosing alternative *j* is equal to:

$$Prob_{ij} = \frac{exp^{V_{ij}}}{\sum_{K=1}^{j} exp^{V_{ik}}} \text{ , with } k \in Ci \quad (5)$$

The maximum likelihood technique can be used to estimate the model. The limitations of this model are: Independent of Irrelevant Alternatives[21]; the assumption of preference homogeneity among respondents implying that all coefficients of all attributes in the utility function are assumed to be the same across all respondents; and the assumption of independent errors over time (Train, 2009). As a results of IIA, MNL model predicts that a change in the attributes of one alternative changes

[21] IIA property means "the relative odds of one alternative being chosen over a second should be independent of the presence or absence of unchosen third alternatives" (McFadden, 1974)

the choice probability of the other alternative proportionally, so that the probability ratios are unaffected (Alfnes, 2004; Brownstone and Train, 1999).

Random Parameter Logit model (RPL) or Mixed Logit

The RPL model mitigates main three limitations of the MNL by allowing for random taste variation within the survey population, unrestricted substitution patterns, and correlation in unobserved factors over time (Hensher and Greene, 2003; Train, 2009). In RPL model, a change in one alternative will not have a proportional effect on the choice probabilities of the other alternatives (relax IIA assumptions). In addition, it allows heteroscedastic and freely correlated error terms (Alfnes, 2004).

RPL probabilities are the integrals of standard logit probabilities over a density of parameters. In other words, the probability is a weighted average of the logit formula evaluated at different values of β_i, with the weights given by the density $f(\beta_i/\theta)$ (Train, 2009).

$$Prob_{ij} = \int \frac{exp^{V_{ij}}}{\sum_{K=1}^{J} exp^{V_{ik}}} f(\beta_i/\theta) d\beta_i \text{ ,with } k \epsilon Ci \qquad (6)$$

where $f(\beta_i/\theta)$ is the density of the coefficients β_i with θ referring to parameters of the density function (mean and variance). Since there is no closed form solution, therefore the probability calculation could be done through simulation techniques according to Train (2009). The simulation process is as follow: the draws of the random term are taken; utility is calculated for each draws; the calculated utilities are inserted into the logit formula (6), and the results are averaged, so called simulated probabilities (SP_i). The simulated log-likelihood function (SLL) is obtained from the simulated probabilities. The maximum simulated likelihood estimator (MSLE) is the value of θ that maximizes SLL.

$$SLL = \sum_{i=1}^{N} \ln SP_i \qquad (7)$$

The choice experiment data is panel data which respondents were asked to repeated choices through the sequence of alternatives, one choice at one time (t). Therefore, the utility of alternative j in choice situation t by respondent i is (Train, 2009):

$$U_{ijt} = \beta'_i x_{ijt} + \varepsilon_{ijt} \qquad (8)$$

where x_{ijt} is a vector of observed variables of individual i and attributes of alternative j in choice situation t, β'_i is unobserved for each individual i and varies within the population with density $f(\beta_i/\theta)$ where θ are the fixed parameters of the distribution, and ε_{ijt} is an extreme value error term that is independently and identically distributed over individuals, alternatives and choices by the same individual. Note that the normally distributed error term for alternative j is the same for all choices made by one individual.

Conditional on β, the probability that the individual makes this sequence of choices is the product of logit formulas:

$$L_i(\beta) = \prod_{t=1}^{T} \left[\frac{exp^{\beta_i' x_{ijt}}}{\sum_{K=1}^{j} exp^{\beta_i' x_{ikt}}} \right] \quad (9)$$

Since the ε_{ijt} are independent overtime, the unconditional probability is the integral of this product overall value of β:

$$Prob_i = \int L_i \beta_i f(\beta_i) d\beta_i \quad (10)$$

Because of its lack of closed form, the parameters of the model (9) are estimated through simulation (Revelt and Train, 1998).

It should be noted that in all choice models based on random utility maximisation only the relative magnitude of the parameters matters. The signs and significance could be interpreted while the individual parameters have no direct interpretation. In addition, since the RPL models include a normally distributed error term that captures some of the variance of the unobserved factors, the magnitudes of the RPL parameters are generally larger than the corresponding MNL parameters. Therefore, the difference in scale between the two models should not be interpreted as a difference in utility (Alfnes, 2004; Brownstone and Train, 1999).

4.3.3 Model Specification 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 was analysed using a random utility framework (Marschak, 1960). The multinomial logit model (MNL) and random parameters model (RPL) were 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: 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 ages 8 years old or younger and having at least one child ages 9-15 years old. Consumption behaviour variables comprise shopping outlet (fresh market/supermarket) and frequency of buying fresh produce. The interaction terms are brand & label variables interacted with shopping location. All variables except price are coded using effects coding.

Model specification for main effect variables:

$$V_{ijt} = \alpha + \beta_1 Price_{ijt} + \beta_2 Freshness1_{ijt} + \beta_3 Freshness2_{ijt} + \beta_4 BRL1_{ijt} + \beta_5 BRL2_{ijt} + \beta_6 BRL3_{ijt} + \beta_7 BRL4_{ijt} + \varepsilon_i \quad (11)$$

Model specification for main effect variables plus socio-demographic variables, consumption behaviours, and interaction terms:

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

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 individual utility for each respondent, alternatives, and choice set; α is a constant to capture the utility of consumers at the status quo, $Price_{ijt}$ 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.

In the RPL model, 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 fix 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:

$$WTP(Label_i) = - (\beta_i - \beta_{no\ info})/\beta_1 \qquad (13)$$

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.

Market simulation of the probabilities to buy different brand & label products was simulated using the estimated parameters from the MNL model. The error term was not considered in this simulation.

4.4 Results

4.4.1 Consumers' socio-demographics characteristics and consumption habits

A total of 350 respondents completed the survey and the selected demographic attributes are provided in Table 4.2.

Table 4.2 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.

4.4.2 Results of main effect variables

Estimation results

The parameter estimates of the MNL and RPL models for main effect variables are listed in Table 4.3. The null hypothesis that all coefficients are zero is rejected by a likelihood ratio test (p-value < 0.01). All coefficients of the main effect variables except Claimed "Safe Produce" label are significantly different from zero at 1% significance level. 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.

For both MNL and RPL models, the estimated parameters give the same sign and are similar except in brand & label attributes that Claimed "Safe Produce" is significant in the RPL model but not in the MNL model. 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 "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.

Table 4.3 Estimated parameters of MNL and RPL models for main effect variables.

Variables	Coefficients	
	MNL	**RPL**
Intercept (option A)	2.8221***	3.0583***
Intercept (option B)	2.6174***	2.9025***
PRICE	-0.02058***	-0.0264***
FRESHNESS		
Today[a]	0.7277***	0.8804***
Yesterday	0.1761***	0.2136***
2 days ago	-0.9038***	-1.0940***
BRAND & LABEL		
No information[a]	-1.2413***	-1.6872***
Claimed "Safe Produce"	-0.0966	-0.1450*
Q mark	0.4751***	0.5563***
Royal Project & Q mark	0.4206***	0.5916**
Doctor's Vegetables & Q mark	0.4421***	0.6843***
St.dev.		
FRESHNESS		
Yesterday		0.3648***
2 days ago		0.6992***
BRAND & LABEL		
Claimed "Safe Produce"		-0.1676
Q mark		0.3681**
Royal Project & Q mark		1.0419***
Doctor's Vegetables & Q mark		0.5885***
Number of respondents	350	350
Number of observations	4,200	4,200
Log likelihood	-3086.5	-2936.1
χ^2	1824.6	2125.4
McFadden's pseudo R^2	0.2282	0.2658

Note: *, ** 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, and 100 replications for simulated probability.
[a] are the reference levels of the attributes, the coefficients was calculated by:
coefficient (ref.lev.) = - Σ coefficients (attribute levels)

In the RPL model, the derived 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.

When comparing the fit of the MNL and RPL models, the RPL models fit the data better because the likelihood function difference (150.4) is greater than critical value of Chi-square with 1 degree of freedom (the critical value for 95% confidence is 3.8) and the value for the RPL model is closer to 0. In addition, the derived standard deviations of brand & labelled attributes are statistically significant. Thus, the RPL model, which allows preference heterogeneity among consumers, better fits the data than the MNL model, thus suggesting that heterogeneity is an important issue to take into account.

Average WTP for food safety label on Chinese cabbage

The average WTP estimating using the MNL and the RPL models are shown in Table 4.4. Consumers are willing to pay 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 command a premium price, but it is smaller than the others. The premium for the Doctor's Vegetables & Q mark attribute is higher than the others although it is not statistically significant difference than other attributes. The WTP estimations for the three food safety labelling options look quite similar.

Table 4.4 WTP estimates for food safety brand & labels on Chinese cabbage.

Attribute	WTP_{MNL} (baht/kg)	WTP_{RPL} (baht/kg)
Claimed "Safe Produce"	55.61 (111.22%)	58.22 (116.44%)
Q mark	83.38 (166.76%)	84.69 (169.38%)
Royal project & Q mark	80.74 (161.48%)	86.02 (172.04%)
Doctor's Vegetables & Q mark	81.78 (163.56%)	89.52 (179.04%)

Note: 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 2013 [Department of Internal Trade (DIT, 2013)].

Market simulations from the MNL model

We simulate the probability that consumers will buy the product of interest in this section to give the example on how price of interesting product could be set under the market simulation on the assumption that there are only certain products in the market and prices of the interested products are varied, *ceteris paribus*. The probability that surveyed consumers will buy interesting products was calculated using the estimated parameters from the MNL model. The error term was not considered in the model.

$$\text{Prob\{option j is chosen\}} = \frac{exp^{V_{ij}}}{\sum_{K=1}^{j} exp^{V_{ik}}} \quad (14)$$

Assuming that there are only 5 products in the market: cabbage with Q mark label at different prices; cabbage with no brand & label sold at 50 baht/kg; cabbage with Claimed "Safe Produce" label sold at 60 baht/kg; cabbage with Royal Project & Q mark sold at 75 baht/kg; and cabbage with

Doctor's Vegetable & Q mark sold at 75 baht/kg, ceteris paribus (all products harvested today and have the same size and weight, etc.). The probability that surveyed consumers will buy cabbage with different labels is shown in Figure 4.2.

The results show that the consumers will prefer to buy products with Q mark label until its price is up to around 75 baht/kg, then they will switch to products with other brands & labels (Royal Project and Doctor's Vegetables) at 75 baht/kg. In any cases, all products are preferred to cabbage with Claimed "Safe Produce" label at 60 baht/kg and no brand & label at 50 baht/kg.

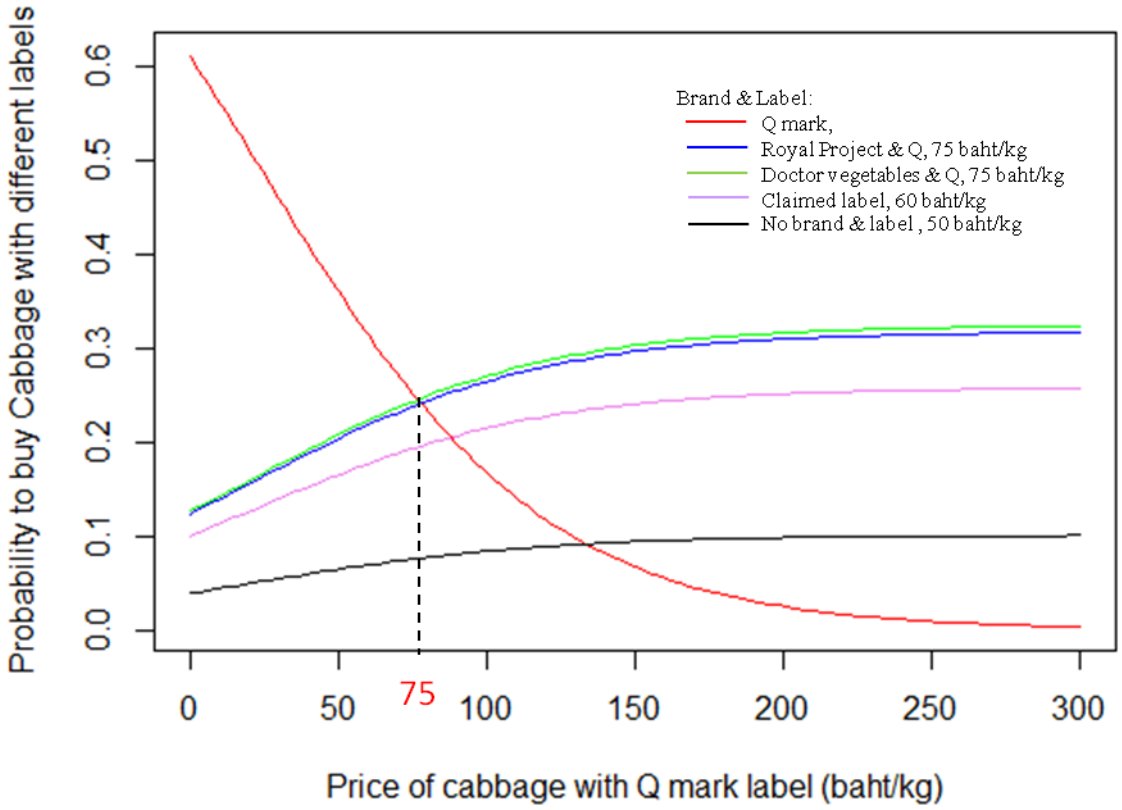

Figure 4.2 The comparison of the probability to buy cabbages with different brands & labels.
Note: Among cabbages with Q mark at different prices with brand & labelled cabbages at price 75 baht/kg, cabbage with claimed label at price 60 baht/kg, and cabbage with no brand & label at price 50 baht/kg.

4.4.3 Impact of socio-demographics, consumption habits, and interaction terms

The parameter estimates of the MNL and RPL models for main effect variables, socio-demographic variable (gender, having at least one child ages 8 years old or younger, having at least one child ages between 9-15 years old), consumption habits and the interaction terms between locations (fresh market/supermarket) and brand & label attribute are listed in Table 4.5. 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). The results are corresponding to the main effect model in section 3.4.2. By including individual characteristics, consumption habits, and the interaction terms we were able to account for consumers with different characteristics and habits.

For both MNL and RPL models, the estimated parameters give the same sign and are similar. Having at least one child aged 8 years old or younger has significantly positive effect on the probability to buy products, while having at least one child aged 9-15 years old has no statistical significant effect on the probability to buy products. The coefficient for purchasing fresh vegetables 2-3 times a week and shopping at fresh market are significantly negative indicating that an increase of frequency of buying per week and shopping at fresh market will decrease the consumer's utility and lower 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 has less value for consumers shopping at fresh market than consumer shopping at supermarket. This might contribute to the fact that Q mark label is not commonly found at fresh market but rather distributed through supermarket, while Claimed "Safe Produce" label could be found at fresh market. Again, the RPL models fit the data better than the MNL model and standard deviations of brand & labelled attributes are statistically significant, thus suggesting that heterogeneity is an important issue to take into account.

Note that we also tested the attitudes of consumers in the MNL and RPL models, however, it does not increase McFadden R^2 significantly, therefore, we decided to leave out the attitude factors out of the model.

Table 4.5 Estimated parameters for RPL with main effects, the interaction terms, socio-demographics, and consumption habits.

Variables	Coefficients	
	MNL	**RPL**
Intercept (option A)	3.1653***	3.4169***
Intercept (option B)	2.9512***	3.2465***
PRICE	-0.0205***	-0.0262***
FRESHNESS		
Today[a]	0.7465***	0.9185***
Yesterday	0.1664***	0.2028***
2 days ago	-0.9129***	-1.1213***
BRAND & LABEL		
No information[a]	-1.2573***	-1.7055***
Claimed "Safe Produce"	-0.1143*	-0.1675**
Q mark	0.4972***	0.5989***
Royal Project & Q mark	0.4441***	0.6161***
Doctor's Vegetables & Q mark	0.4303***	0.6580***
Location Interactions with Brand & Label		
Claimed * Fresh market	0.1250**	0.1481**
Q mark * Fresh market	-0.0880*	-0.1362**
Royal Project * Fresh market	-0.0417	-0.0714
Doctor's Vegetables * Fresh market	-0.0100	0.0052
Claimed * Supermarket[a]	-0.1250**	-0.1481**
Q mark * Supermarket[a]	0.0880*	0.1362**
Royal Project * Supermarket[a]	0.0417	0.0714
Doctor's Vegetables * Supermarket[a]	0.0100	-0.0052
GENDER		
Female	-0.0999	-0.1108
Male[a]	0.0999	0.1108
Child ≤ 8 years old		
Yes	0.2295***	0.2382***
No[a]	-0.2295***	-0.2382***
Child 9 to 15 years old		
Yes	0.0986	0.1156
No[a]	-0.0986	-0.1156
FRESH MARKET	-0.2547***	-0.2663***
SUPERMARKET[a]	0.2547***	0.2663***
Purchasing Frequency		
Once per month[a]	-0.4150	-0.4685
2-3 times per month	0.3272	0.3600
Once per week	0.1222	0.1482
2-3 times per week	-0.2317**	-0.2389**
4 times or more per week	0.1973	0.1992

Table 4.5 (Continue)

	Standard deviations	
	MNL	**RPL**
FRESHNESS		
Yesterday		0.3343***
2 days ago		0.7159***
BRAND & LABEL		
Claimed "Safe Produce"		-0.0635
Q mark		0.4067 **
Royal Project & Q mark		1.0200 ***
Doctor's Vegetables & Q mark		0.5861***
Number of respondents	344	344
Number of observations	4128	4128
Log likelihood	-3002.9	-2852.2
χ^2	1858.6	2159.9
McFadden's pseudo R^2	0.23633	0.27465

Note: *, ** 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, and 100 replications for simulated probability.
[a] are the reference levels of the attributes, the coefficients was calculated by:
coefficient (ref.lev.) = - Σ coefficients (attribute levels)

4.5 Discussion

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. This finding implies that when providing such information (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 *et al.*, 2005).

The high maximum WTP (110% to 180% compared to regular market prices) in this study indicate the 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 that they search for an "extra" guarantee in term of certification or well-known brands (De Jonge *et al.*, 2007; Henson and Northen, 2000). 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 shows 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 prefer just to have 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 safer than those regularly sold on the market and trusted brands and labels could become a tool to differentiate products and to enhance the competitiveness in the high-value market (Henson and Reardon, 2005). On the other hand, the need for reassurance may provide market incentives to introduce 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 a value on claimed label less than on the other labels because we informed them about the meaning of "claimed" label in advance. In the study, surveyed consumers were in the position to understand that claimed label does not possess any real guarantee in term of third-party certification, but it was only based on trust in the claimer; however, they give some additional value to claimed safety compared to no information. Apparently, information provision to consumers are vital for food safety label. The government agency must play an important role in disseminating knowledge and information regarding food safety and food safety labels in order to mitigate the risk of consumer deception by fake or self-claimed labels.

Our results suggest to producers and marketers that there is a perceived need for a higher level of food safety in the fresh produce supply chain. There is a potential market share for fresh produce products bearing food safety labels, so that they 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) (ThaiPost, 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 result from the RPL model also suggests 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.

4.6 Conclusions and Future Research

As a final remark, we point out that our results suggest that food a safety label is beneficial for Thai consumers. Hence, the food safety label policy should be supported to reach food safety targets and to provide consumers with information and protection from deception. Information and trust are vital for the policy as they are the main component in the food market. Q mark is currently the most promising food safety label because it could be accessed by all small farmers and can be found in all markets; however, the improvement of the credibility of the system and the enforcement of the regulation are crucial and urgently required. The dissemination of information regarding food safety, certification and labels should be able to effectively reach consumers. Finally, food safety labels can be used as an incentive to promote safe production/consumption in accordance to the international trend. This would be necessary for Thailand in light of the strategy of positioning itself as “Thai Cuisine to the World”.

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. Although care must be taken when making conclusions based on a hypothetical choice experiment, our results generally indicate high WTP a premium price for food safety label. An important limitation is that, although we chose to put brand & label attributes together 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.

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 habit, 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.

Appendix 4.1 Quantitative survey for empirical study – Thai Version

แบบสอบถาม

แบบสอบถามชุดนี้เป็นเอกสารเพื่อใช้ในการศึกษาวิจัยประกอบการทำวิทยานิพนธ์ในระดับปริญญาเอกเรื่อง “ความพึงพอใจและความเต็มใจจ่ายของผู้บริโภคที่มีต่อผักสดที่มีตรารับรองความปลอดภัยของอาหาร”(Consumer Preference and Willingness to Pay for Food Safety Label on Fresh Produce) คณะการตลาดสินค้าเกษตรและอาหาร มหาวิทยาลัยโบโลญญา คณะผู้วิจัยจึงใคร่ขอความร่วมมือจากท่านในการกรอกข้อมูลในแบบสอบถามนี้ด้วยข้อมูลที่เป็นจริงเพื่อความสมบูรณ์ในการประเมินผลต่อไป และขอขอบพระคุณที่ท่านกรุณาให้ความร่วมมือเป็นอย่างดี ทั้งนี้ข้อมูลจากแบบสอบถามนี้จะใช้เพื่อการประมวลผลในเชิงวิชาการเท่านั้น

คำชี้แจง กรุณาตอบแบบสอบถามโดยการทำเครื่องหมาย “√□” ลงในช่อง □ หรือกรอกข้อมูลลงในช่องว่าง

ส่วนที่ 1 พฤติกรรมการบริโภคอาหารและผักสด

1. สถานที่ที่ท่านนิยมซื้อผักสด (ตอบได้มากกว่า 1 ข้อ)

กรุณาประเมินสัดส่วนโดยคิดเป็นเปอร์เซ็นของผักสดทั้งหมดที่ท่านซื้อเมื่อเดือนที่ผ่านมา

□ ตลาดสด ประมาณ _____%

□ ซุปเปอร์มาร์เก็ต ประมาณ _____%

□ ร้านสินค้าเพื่อสุขภาพ เช่น เลมอนฟาร์ม สันติอโศก ประมาณ _____%

□ รถขายผัก ประมาณ _____%

□ จากเกษตรกรโดยตรง ประมาณ _____%

□ อื่น ๆ (โปรดระบุ) _____ ประมาณ _____%

รวมคิดเป็น100% ของปริมาณผักสดที่ท่านซื้อ

2. ท่านรับประทานอาหารนอกบ้าน และ/หรือ ซื้ออาหารปรุงสำเร็จ/สำเร็จรูป/กึ่งสำเร็จรูปมากน้อยเพียงใด กรุณาประเมินสัดส่วนโดยประมาณ คิดเป็นเปอร์เซ็นของมื้ออาหารทั้งหมดที่ท่านรับประทานเมื่อสัปดาห์ที่ผ่านมา

_____% รับประทานอาหารนอกบ้าน และ/หรือ ซื้ออาหารสำเร็จรูป / กึ่งสำเร็จรูปเพื่อการบริโภค

_____% รับประทานอาหารที่บ้าน และ/หรือ ปรุงอาหารเพื่อรับประทานเอง

รวมคิดเป็น100% ของมื้ออาหารทั้งหมด

3. ความถี่ในการซื้อผักสด

□ ประมาณ 1 ครั้งต่อเดือนหรือน้อยกว่า

□ เดือนละ 2 – 3 ครั้ง

□ 1 ครั้งต่อสัปดาห์

□ 2-3 ครั้งต่อสัปดาห์

□ 4 ครั้งต่อสัปดาห์หรือมากกว่า

4. ปัจจัยที่ท่านให้ความสำคัญในการเลือกซื้อผักสด โดยตอบได้มากกว่า 1 ข้อ แต่ไม่เกิน 3 ข้อ

กรุณาเรียงลำดับความสำคัญจากมากไปน้อย (1, 2, 3)

☐ ราคา	☐ ขนาด
☐ ความสด	☐ รูปลักษณ์ เช่น สีสัน ตำหนิ (อาทิ รูจากแมลงเจาะ)
☐ ความสะอาด	☐ ความเชื่อมั่นในตัวผู้ขาย
☐ ตรา “อาหารปลอดภัย” รับรองโดยกระทรวงสาธารณสุข	☐ ตรา “Q” รับรองโดยกรมวิชาการเกษตร กระทรวงเกษตรและสหกรณ์
☐ ตราเกษตรอินทรีย์ เช่น “ผลิตภัณฑ์อินทรีย์”	☐ ตราสินค้าของผู้จำหน่าย เช่น โครงการหลวง และผักด๊อกเตอร์
☐ ตราร้านค้าผู้จัดจำหน่าย เช่น เลมอนฟาร์ม สันติอโศก	☐ อื่น ๆ (โปรดระบุ)_____
	☐ ไม่ใช่ปัจจัยข้างต้นทั้งหมด

5. ท่านเคยซื้อผักสดที่มีตรารับรองความปลอดภัยของอาหาร (เช่น ตรา Q) บ้างหรือไม่

☐ ไม่เคย ☐ เคย คิดเป็น _____% (เปอร์เซ็น) ของปริมาณผักสดทั้งหมดที่ท่านซื้อเมื่อเดือนที่ผ่านมา

6. ท่านเคยซื้อผักสดที่มีตรา “โครงการหลวง” ในโครงการพระราชดำริ บ้างหรือไม่

☐ ไม่เคย ☐ เคย คิดเป็น _____% (เปอร์เซ็น) ของปริมาณผักสดทั้งหมดที่ท่านซื้อเมื่อเดือนที่ผ่านมา

ส่วนที่ 2 ปัจจัยที่มีผลต่อการตัดสินใจเลือกซื้อผักสด

ในส่วนที่ 2 นี้ ขอให้ท่านตัดสินใจเลือกผักกาดขาว (ซึ่งท่านสามารถหาซื้อได้ทั่วไปจากตลาดหรือห้างร้านต่าง ๆ) จากผักกาดขาวทั้งหมด 12 คู่ ที่มีราคาตั้งแต่ 25 ถึง 100 บาทต่อกิโลกรัม โดยผักกาดขาวเหล่านี้จะมีความสดและตรา/ฉลาก ***แตกต่างกัน*** นอกเหนือจากนั้นผักเหล่านี้มีคุณลักษณะที่เหมือนกัน (ได้แก่ สีสัน และขนาด เป็นต้น)

กรุณาเลือกผักกาดขาว A หรือผักกาดขาว B ที่ท่านคิดว่าท่านมีความพึงพอใจมากที่สุด หรือ C ซึ่งหมายถึงไม่เลือกทั้ง A และ B เมื่อท่านไม่ต้องการทั้งผักกาดขาว A และ B

คำอธิบายเพิ่มเติม

ความสด หมายถึง เวลานับจากการเก็บเกี่ยว (วัน)

ตรา/ฉลาก หมายถึง ฉลากบนห่อบรรจุภัณฑ์ อันได้แก่

ตรา "Q" หมายถึง ตรารับรองคุณภาพและความปลอดภัย โดยกรมวิชาการเกษตร กระทรวงเกษตรและสหกรณ์

ตรา "ผักด๊อกเตอร์" หมายถึง ตราสินค้าจากบริษัทเอกชน (บริษัท ผักด๊อกเตอร์ จำกัด) ซึ่งจำหน่ายผักปลอดสารพิษมาตั้งแต่ปี พ.ศ. 2536 โดยผลิตภัณฑ์ส่วนใหญ่จำหน่ายในซุปเปอร์มาร์เก็ตและโมเดิร์นเทรด

ตรา "โครงการหลวง" หมายถึง ตราสินค้าที่เป็นผลผลิตจากโครงการส่วนพระองค์ในพระบาทสมเด็จพระเจ้าอยู่หัว

ตรา "ผักปลอดสารพิษ" หมายถึง ผู้ผลิตหรือผู้จัดจำหน่ายสินค้ารับรองด้วยตนเองว่าสินค้าดังกล่าวเป็นผักปลอดสารพิษ

"ไม่มีฉลาก" หมายถึง สินค้าดังกล่าวเป็นสินค้าทั่วไปที่ไม่มีตราหรือฉลากรับรองใด ๆ

กรุณาตัดสินใจประหนึ่งว่าท่านกำลังตัดสินใจเลือกซื้อผักกาดขาวในสถานการจริงเพื่อนำมาประกอบอาหารและรับประทานในครัวเรือนของท่าน ทั้งนี้การเลือกซื้อสินค้าหนึ่ง ๆ จะทำให้ท่านมีเงินเพื่อซื้อสินค้าอื่น ๆ น้อยลง

กรุณาเขียนทางเลือกผักกาดขาวที่ท่านจะเลือกซื้อ (A หรือ B หรือ C) ลงในช่องว่างที่กำหนด

Set 1	Set 2	Set 3	Set 4
1	12	1	1
2	11	12	2
3	10	2	11
4	9	11	12
5	8	3	3
6	7	10	4
7	6	4	9
8	5	9	10
9	4	5	5
10	3	8	6
11	2	6	7
12	1	7	8

ส่วนที่ 3 ทัศนคติที่มีต่อความปลอดภัยทางอาหารและตรารับรองความปลอดภัยของอาหาร

ท่านมีความคิดเห็นต่อข้อความต่อไปนี้อย่างไร

กรุณาตอบแบบสอบถามโดยการทำเครื่องหมาย “√□”□ ลงในช่องความคิดเห็นที่ตรงกับความเห็นของท่าน

ข้อความ	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
7. ผักสดในปัจจุบันมีคุณภาพและความปลอดภัยเพิ่มมากขึ้นกว่าเมื่อ 10 ปีที่แล้ว					
8. การรับประทานผักและผลไม้สดอาจเพิ่มความเสี่ยงต่อปัญหาสุขภาพ เนื่องจากสารเคมีตกค้าง หรือการปนเปื้อนของแบคทีเรียหรือจุลินทรีย์					
9. ราคาที่สูงกว่าน่าจะเป็นตัวบ่งชี้ถึงคุณภาพที่ดีกว่าและความปลอดภัยที่มากกว่าของผักสด					
10. ผักสดที่มีรอยตำหนิตามธรรมชาติ เช่น รูจากแมลงเจาะ มีความปลอดภัยกว่าผักสดที่ไม่มีรอยตำหนิ					
11. ผักสดที่จำหน่ายในร้านค้าปลีกชื่อดังมีความปลอดภัยกว่าผักสดที่จำหน่ายในสถานที่อื่น ๆ					
12. ฉันมีความเชื่อมั่นในความปลอดภัยของผักสดที่ได้รับมาตรฐานการรับรองจากหน่วยงานรัฐบาล					
13. ฉันมีความเชื่อมั่นในความปลอดภัยของผักสดที่ได้รับมาตรฐานการรับรองจากหน่วยงานเอกชน					
14. ฉันมีความเชื่อมั่นในความปลอดภัยของผักสดที่ได้รับมาตรฐานการรับรองจากหน่วยงานต่างประเทศ					
15. ฉันมีความเชื่อมั่นในความปลอดภัยของผักสดที่บนฉลากบรรจุภัณฑ์ระบุว่า “ผักปลอดสารพิษ ”					
16. ฉันมีความยินดีจ่ายมากขึ้นสำหรับผักสดที่มีตรารับรองความปลอดภัยของอาหาร					

ส่วนที่ 4 ข้อมูลส่วนบุคคลทั่วไป

17. เพศ ☐ หญิง ☐ ชาย

18. ท่านเกิดปี พ.ศ._____

19. จำนวนผู้ที่อาศัยอยู่ในบ้านเดียวกับท่าน _____ คน

20. จำนวนเด็กที่มีอายุ 8 ปีหรือต่ำกว่า 8 ปี ที่อาศัยอยู่ในบ้านเดียวกับท่าน _____ คน

21. จำนวนเด็กที่มีอายุระหว่าง 9-15 ปีที่อาศัยอยู่ในบ้านเดียวกับท่าน _____ คน

22. จำนวนผู้สูงอายุที่มีอายุมากกว่า 60 ปีที่อาศัยอยู่ในบ้านเดียวกับท่าน _____ คน

23. ระดับการศึกษาสูงสุด

☐ ประถมศึกษา ☐ ปริญญาจากมหาวิทยาลัยหรือเทียบเท่า

☐ มัธยมต้น ☐ อื่น ๆ (โปรดระบุ) _____

☐ มัธยมปลายหรือเทียบเท่า

24. อาชีพ

☐ นักเรียน/นักศึกษา ☐ ค้าขาย/ธุรกิจส่วนตัว

☐ ข้าราชการ/รัฐวิสาหกิจ ☐ แม่บ้าน/พ่อบ้าน

☐ ลูกจ้างเอกชน/พนักงานบริษัท ☐ อื่น ๆ (โปรดระบุ) _____

25. รายได้เฉลี่ยต่อเดือน<u>ต่อครัวเรือน</u>

☐ น้อยกว่า 10,000 บาท/เดือน

☐ 10,000 - 24,999 บาท/เดือน

☐ 25,000 - 39,999 บาท/เดือน

☐ 40,000 - 54,999 บาท/เดือน

☐ 55,000 - 69,999 บาท/เดือน

☐ เท่ากับหรือมากกว่า 70,000 บาท/เดือน

26. มีสมาชิกท่านใดในครัวเรือนของท่านที่ป่วยเป็นโรคอันเนื่องมาจากอาหารหรือไม่

(อาทิเช่น โรคเบาหวาน โรคความดันสูง โรคหัวใจ โรคมะเร็ง เป็นต้น)

☐ มี ☐ ไม่มี

ขอขอบพระคุณทุกท่านเป็นอย่างสูงที่ได้สละเวลาในการตอบแบบสอบถามในครั้งนี้

Appendix 4.2 Quantitative survey for empirical study – English Version

Questionnaire

This questionnaire is subjected to research entitled "Consumer Preference and Willingness to Pay for Food Safety Label on Fresh Produce" studied by a doctoral student in Dipartimento di Scienze Agrarie (DipSA) Area Economia agraria ed Estimo at Alma Mater Studiorum-Università di Bologna, Bologna, Italy. The information collected by the respondents will be used for academic research only. Your answers are anonymous.

Thank you very much for your cooperation

Instruction: Please complete all questions by filling in the "blank" or putting the mark "√" in the box of your choice.

Part 1: Introduction/ Dietary Habit and Consumption pattern

1. Where do you normally buy fresh vegetables (can be more than 1 answer)
   Please provide the approximate percentage of your fresh vegetables purchasing at different outlets over the last month (your best guess is fine, they should add to 100%)
   - □ Fresh markets _____%
   - □ Hyper/Supermarket_____%
   - □ Healthy food stores _____%
   - □ Mobile car selling vegetables _____%
   - □ Farmer directly_____%
   - □ Others (please specify)_____ _____%

   100% = sum total

2. How frequently do you typically eat out/get take out at a restaurant or food service establishment? Please provide the approximate percentage of your eating out comparing to eating at home over the last week (your best guess is fine, they should add to 100%)
   _____% eat out
   _____% eat at home
   100% = sum total

3. How often do you purchase fresh vegetables?
   - □ Once per month or less
   - □ 2-3 times per month
   - □ Once per week
   - □ 2-3 times per week
   - □ 4 or more times per week

4. Which factors do you usually considered when purchasing fresh vegetables?
Please mark **up to three** product traits of those listed below that that you consider the most important when you purchase fresh vegetables. Please rank the importance of the factor from most importance (1) to lower importance (3)

☐ Price	☐ Size
☐ Freshness	☐ Appearance of the products (e.g. colour, natural defects, hole from pests)
☐ Sanitary	☐ Trust to seller
☐ "Food Safety" label from the Ministry of Public Health (MOPH)	☐ "Q" mark from the Ministry of Agriculture and Cooperatives (MOAC)
☐ Organic label e.g. "Organic Thailand", etc.	☐ Private brand e.g. "Royal Project", "Doctor Vegetables", etc.
☐ Shop brand e.g. "Golden Place, "Lemon Farm", etc.	☐ Other (please specify) _____
	☐ None of above

5. Have you ever purchase fresh vegetables with food safety label (e.g. Q mark)?
☐ No
☐ Yes, approximately ___% of total amount of fresh vegetables you purchased over the last month

6. Have you ever purchase fresh vegetables with "Royal Project" brand?
☐ No
☐ Yes, approximately ___% of total amount of fresh vegetables you purchased over the last month

Part 2: Factors that have influence on purchasing decision for fresh vegetables

In this section of this survey you are provided with 12 different pairs of alternative fresh Chinese cabbage that could be available for purchase in the fresh market or the retail grocery store where you typically shop. Besides the attributes listed below, each product possesses the same characteristics (e.g., similar colour and size) and is produced in Thailand. Chinese cabbage prices vary from Baht 25/kg. to Baht 100/kg. For each pair of cabbages (option A and B), please select the cabbage that you would purchase, or neither (option C), if you would not purchase either cabbage. Not purchasing cabbages both from option A and B means both alternatives do not have value for you, so you decide not to purchase any of them

Please consider the following information to help you interpret alternative products.

Freshness: Time since harvest (day)
Brand/Label: The package that contains the cabbage for your purchase may be labelled as follows:

Q mark: This label stands for "Thai Quality Product" and is approved by the National Bureau of Agriculture Commodity and Food Standard (ACFS), the Ministry of Agriculture and Cooperatives.

ผักดอกเตอร์ผักดอกเตอร์**:** This label stands for "Doctor's Vegetables" which is a private company producing and distributing pesticide safe vegetables since 1993. Products are mostly distributed through the modern trade.

โครงการหลวงโครงการหลวง**:** This label stands for "Royal Project" set up by the Royal Project Foundation.

ผักปลอดสารพิษ or Claimed "Safe Produce": The practices and processes used and all claims made by the product label have been verified by the farmer and/or distributors.

Typical/Unlabelled: "Common/usual versions" of cabbages that are typically consumed.

It is important that you make your selections like you would as if you were actually facing these choices in your retail purchase decisions. Noting that buying a product means that you would have less money available for other purchases.

Which of the following three choices do you prefer for each choice set?
Please cross "X" the item listed below that you are most likely to purchase.

Choice Set	Option A	Option B	Option C
Choice Set 1			
Choice Set 2			
Choice Set 3			
Choice Set 4			
Choice Set 5			
Choice Set 6			
Choice Set 7			
Choice Set 8			
Choice Set 9			
Choice Set 10			
Choice Set 11			
Choice Set 12			

Part 3: Attitudes of food safety and food safety label
Please score your opinion for these statements

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7. I think the quality and safety of fresh vegetables has been improving in recent year than 10 years ago					
8. I consider eating fresh vegetables is risky for health due to chemical residue or biological contamination					
9. Higher price of fresh vegetables may indicates better quality and safety of the products					
10. I consider fresh vegetables with natural defects (e.g. hole from pest) safer than others					
11. I have confidence in the safety of fresh vegetables sold at reputable stores					
12. I have confidence in the safety of fresh vegetables certified by the government agency					
13. I have confidence in the safety of fresh vegetables certified by the private company					
14. I have confidence in the safety of fresh vegetables certified by international organization					
15. I have confidence in the safety of fresh vegetables the claimed “Safe Fresh Produce” label					
16. I am willing to pay more for fresh vegetables with food safety label					

Part 4: Household characteristics

17. What is your gender?
- Female
- Male

18. I was born in year _____

19. How many persons including you live in your household?
_____persons

20. How many children age 8 years old or less than 8 years old are there in your household?
_____persons

20. How many children age between 9-15 years old are there in your household?
_____persons

21. How many elder age more than 60 years old are there in your household?
_____persons

22. What is the highest level of education level you have complete?
- Primary school
- Middle school
- High school
- University degree
- Other (please specify) _____

23. What is your occupation?
- Student
- Government employee
- Private company employee
- Business owner
- Housewife
- Other (please specify) _____

24. How much is your household income per month?
- ≤ 10,000 baht/month
- 10,000 - 24,999 baht/month
- 25,000 - 39,999 baht/month
- 40,000 - 54,999 baht/month
- 55,000 - 69,999 baht/month
- ≥ 70,000 baht/month

25. In your household, have any member affected by food-borne diseases?
(e.g. diabetic. high blood pressure, heart disease, cancer)
- Yes
- No

End of the questionnaire
Thank you very much for your cooperation

Appendix 3.3 Example of choice set used in choice experiment – English Version

Note: There are 4 choice sets, all compose of 12 choice situations ordered differently

Choice situation 1

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

Choice situation 2

Option A	Option B	Option C
 Freshness = 2 days ago 50 baht/kg	 Freshness = today 100 baht/kg	Neither A or B

Choice situation 3

Option A	Option B	Option C
 Freshness = yesterday No label 100 baht/kg	 Freshness = today 25 baht/kg	Neither A or B

Choice situation 4

Option A	Option B	Option C
 Freshness = today No label 75 baht/kg	 Freshness = 2 days ago 25 baht/kg	Neither A or B

Choice situation 5

Option A	Option B	Option C
 Freshness = yesterday 75 baht/kg	 Freshness = today Claimed “Safe Fresh Produce” ("ผักปลอดสารพิษ") 50 baht/kg	Neither A or B

Choice situation 6

Option A	Option B	Option C
 Freshness = 2 days ago No label 25 baht/kg	 Freshness = yesterday 100 baht/kg	Neither A or B

Choice situation 7

Option A	Option B	Option C
 Freshness = yesterday  50 baht/kg	 Freshness = 2 days ago Claimed “Safe Fresh Produce” ("ผักปลอดสารพิษ") 75 baht/kg	Neither A or B

Choice situation 8

Option A	Option B	Option C
 Freshness = 2 days ago  100 baht/kg	 Freshness = yesterday No label 50 baht/kg	Neither A or B

Choice situation 9

Option A	Option B	Option C
 Freshness = yesterday Claimed “Safe Fresh Produce” ("ผักปลอดสารพิษ") 25 baht/kg	 Freshness = 2 days ago No label 75 baht/kg	Neither A or B

Choice situation 10

Option A	Option B	Option C
		Neither A or B
Freshness = 2 days ago	Freshness = today	
 	No label	
75 baht/kg	75 baht/kg	

Choice situation 11

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

Choice situation 12

Option A	Option B	Option C
		Neither A or B
Freshness = today	Freshness = 2 days ago	
 	Claimed “Safe Fresh Produce” ("ผักปลอดสารพิษ")	
50 baht/kg	50 baht/kg	

CHAPTER 5

SUMMARY AND CONCLUDING REMARK

5.1 Summary and Further Research

This research presents an analysis of the current situation of GAPs adoption in the Thai fresh produce industry and the potential development and use of food safety label on fresh produce products in Thailand. The analysis has been made for both supply and demand sides. The previous research regarding Thai food safety laws, regulations, and GAPs adoption in the production were reviewed. The stakeholders' perception toward GAPs adoption along the supply chain were analysed. From the consumer side, the consumers' preferences and their willingness to pay for food safety label were investigated.

Chapter 2 contributes to the literature, presenting the current situation of GAPs adoption in Thai fresh produce industry. Currently there are three main voluntary GAP standards adopted in Thailand - National GAP or Q-GAP, ThaiGAP, and GLOBALGAP. While GLOBALGAP is a private internationally recognised standard, Q-GAP and ThaiGAP are local standards, which have been developed by the government and private sectors, respectively. Considering the current situation of GAP implementation in the Thai domestic market, the implementation is considerably weak. Apart from the voluntary standards discussed so far, there is not a comprehensive mandatory standard according to Thai law. Currently, the Thai domestic market does not provide enough market incentives for adoption (e.g. premium price or increase the possibility to entry the market or enhance the competitiveness of the supplier). Hence, most of producers do not perceive the advantages of adopting GAP, as expected market benefits derived from GAP or FSAS implementation are not apparent. However, this trend seems to be slowly changing as retailers have recently started to impose GAP adoption on their suppliers to achieve higher food safety level and gain a favourable reputation as safe food providers. There is also evidence that Thai consumers have increased awareness on food safety and some of them are willing to pay a higher price for safe food, especially in the urban area. These situations indicate that in the future, more stringent GAP schemes may be applied in the domestic market as consumers pay more attention to food safety issue.

The subjective perceptual map, which illustrate the positioning of different GAP standards in the researcher's perception, reveals that GLOBALGAP is the benchmark for other GAP standards, both on trustworthiness and business usefulness aspects. While ThaiGAP is perceived as possessing a higher trustworthiness than Q-GAP, Q-GAP confers a higher business advantages because it has been recognised on the domestic and regional market. In order to improve trustworthiness, Q-GAP standard regulation should be strictly enforced, the inspection should be done by third parties and an efficient traceability system need to be implemented. Whereas, promotion and marketing activity should be applied for ThaiGAP in order to improve its recognition in the market. Note that the result from the perception map is subjective to the researcher's perception, results should be interpreted carefully.

Further research on practitioners' and stakeholders' perceptions of standards should be conducted in order to obtain more information regarding these standards e.g. perceived trustworthiness and business usefulness from the business point of view. This could be conducted by building upon the results of this review and using investigation methods based on primary data. For instance, the MDS technique we used to subjectively describe our point of view of the standards could be further employed in the analysis of the perceptions of practitioners and to elucidate the (dis)advantages of each standards. Further research on consumers' perception and willingness to pay for certified products could be conducted in order to obtain information from the demand side.

Chapter 3 addresses difficulties and barriers of GAP adoption in the Thai fresh produce industry from stakeholders' perceptions (i.e., experts, the governmental authorities, producers, distributors, exporters and consumers). The main findings suggest the stakeholders agree that GAPs are useful and could be used as a tool to control and monitor food safety in the supply chain. However, they perceived low credibility of national GAP or Q-GAP standards implemented in Thai domestic markets, due to the lack of verification and traceability system; also the system is carried out by the governmental authorities. For the surveyed consumers, factors affecting their purchasing decision are price, freshness, appearance, quality (e.g. taste, sweetness, size, etc.), relations with sellers and service, seasonal produce, origin of products, shelf-life, package, convenience and food safety. The results suggest that consumers are the key actors in developing GAP implementation in Thailand, whilst the modern trade is the main driver in Thai domestic market as it has highly influence in producers' adoption and implementation. Wholesaler may be an alternative actor where governmental authorities can disseminate information and connect with a wide range of producers. The national GAP or Q-GAP is the most promising standard which could be reached by all small farmers, however, the improvement of the credibility of the system and the enforcement of the regulation are crucial and urgently required. Nevertheless, the creation of stakeholder's awareness toward food safety issues and information provision are still crucial. The limitation is that respondents in this chapter are mainly from Bangkok and vicinity, therefore, the results imply only the situation in these areas and cannot be generalized to the picture of Thailand as a whole. Given the nature of qualitative exploratory research, we cannot give conclusive results or generalize to the whole industry but the results can be served as input for further research in this research topic. For instance, what is the consumers' perception of food safety and what are the signal they looking for; which types of information should be provided for consumers?; what are consumer preferences and willingness to pay for food safety certified products?

Chapter 4 presents a choice experiment to study consumers preference for food safety label on fresh produce product, in this case, Chinese cabbage. Results suggest that 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 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. This finding implies

that when providing such information (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.

The high premium prices (110% to 180% compared to regular market prices) in this study indicate the perceived need to have safer food available on the market and social desirability to be informed by food safety label. On the other hand, this high premium might be affected by hypothetical bias, due to the nature of the study we performed; therefore, in a possible future research at a nation-wide scale, aimed at evaluating accurate welfare measures, it would be advisable to pair a consumer survey based on a representative sample with more reliable findings on the willingness-to-pay of consumers derived from non-hypothetical techniques that use incentive-compatible mechanisms (i.e., experimental auctions). This would allow comparison of the results, estimation of the size of the possible hypothetical bias effect, and calibration of the survey results.

The results also shows 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, the general consumers are willing to pay more or less the same for any combination of guaranteed brands and labels proposed. This could imply that, perhaps, the type of brand & label does not matter, they prefer just to have an additional guarantee. This might infer that for consumers one food safety label is enough and adding other labels or brands with the same meaning does not increase utility of consumers. However, we cannot safely draw this conclusion because the experimental design does not allow us to segregate between the effect of brand and labels. Although surveyed consumers are in general concerned about food safety, they are heterogeneous in that their WTP a price premium to cover the cost of providing safety attributes varies considerably. The RPL model, which allows preference heterogeneity among consumers, better fits the data than MNL model, and standard deviations of brand and labelled attributes are statistically significant, thus suggesting that heterogeneity is an important issue to take into account. Hence, probably there are market segments preferring different food safety guarantees. 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.

Although care must be taken when making conclusions based on a hypothetical choice experiment, our results generally indicate high WTP a price premium for food safety label. An important limitation is that, although we chose to put brand & label attributes together 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.

Future research could also try to use alternative ways to take into account heterogeneity of preferences, for instance, using a segmentation approaches (e.g., latent class modelling) to identify key market segments for the product and include the consumption habit, 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.

5.2 Concluding Remark

This dissertation contributes to the economics of quality assurance and labelling, specifically addressing GAPs and food safety label in fresh produce supply chains. The findings have important implications for public policy and firm strategic decision making. It shows that Q-GAP could be effectively used to improve food safety in Thai domestic market, but that its credibility should be improved. GAP scheme and food safety label policy should be supported to reach food safety targets and to provide consumers with information and protection from deception. The creation of stakeholder's awareness toward food safety issues and the delivery of reliable and sound information are crucial. Thai consumers are willing to pay a price premium for food safety labelled produce, therefore the label is beneficial for Thai consumers since it could reduce the asymmetry of information between them and producers. Results suggest to producers and marketers that there is a perceived need for a higher level of food safety in the fresh produce supply chain. Hence, there is a potential market share for fresh produce products bearing food safety labels so that they 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. Finally food safety labels can be used as an incentive to promote safe production/consumption in accordance to the global trends.

CHAPTER 6

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