THAI CONSUMER WILLINGNESS TO PAY FOR CONSUMER PRODUCTS WITH CARBON REDUCTION LABEL

PATSARA TETANANANTH

A THEMATIC PAPER SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION
(BUSINESS MODELING AND ANALYSIS)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2011

Thematic
entitled

THAI CONSUMER WILLINGNESS TO PAY FOR CONSUMER PRODUCT WITH CARBON REDUCTION LABEL

Patsara Tetanananth
.....
Ms. Patsara Tetanananth
Candidate

N. Udomkit
.....
Lect. Nuntana Udomkit, Ph.D.
Major advisor

Yingyot Chiaravutthi
.....
Asst. Prof. Yingyot Chiaravutthi, Ph.D.
Co-advisor

B. Maha
.....
Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

Yingyot Chiaravutthi
.....
Asst. Prof. Yingyot Chiaravutthi, Ph.D.
Program Director
Master of Business Administration
Program in Business Modeling and
Analysis
International College
Mahidol University

Thematic
entitled

THAI CONSUMER WILLINGNESS TO PAY FOR CONSUMER PRODUCTS WITH CARBON REDUCTION LABEL

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Business Administration
(Business Modeling and Analysis)
on
March 5, 2011

Patsara Tetananganth
.....
Ms. Patsara Tetananganth
Candidate

.....
Assoc. Prof. Piriya Pholphirul, Ph.D.
Chair

.....
Lect. Nuntana Udomkit, Ph.D.
Member

.....
Asst. Prof. Yingyot Chiaravutthi, Ph.D.
Member

.....
Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

.....
Assoc. Prof. Rassamidara Hoonsawat, Ph.D.
Dean
International College
Mahidol University

ACKNOWLEDGEMENTS

I would like to express my gratitude to my supervisor Lect. Nuntana Udomkit and my co-advisor Asst. Prof. Yingyot Chiaravutthi who have provided me so much help and support during my research with their expertise and research experience. Couple with their encouragement, critical advice and deeply insightful comments and discussion have helped me down new paths of discovery and knowledge.

I am pleasure to thank all the MUIC staffs that have provided me helpful resources and other relevant materials. Thanks to all of my friends who have journeyed with me throughout the MBA program, we have shared so many great experiences and discovered of what life is about and how to make the best out of it. Moreover, I personally would like to thank Mrs. Sawitree Pitchayachai and her staffs who supported me during experiments at Mahidol University, Salaya.

Lastly, and most important, I would like to thank the entire participants who participate in my experiment to make this research complete.

Patsara Tetanananth

THAI CONSUMER WILLINGNESS TO PAY FOR CONSUMER PRODUCT WITH CARBON LABEL

PATSARA TETANANANTH 5038743 ICMA/M

M.B.A. (BUSINESS MODELING AND ANALYSIS)

THEMATIC PAPER ADVISORY COMMITTEE: NUNTANA UDOMKIT, Ph.D., YINGYOT CHIARAVUTTHI, Ph.D.

ABSTRACT

Global Warming is the biggest problem facing by human race in this century. The rise of environmental awareness has been felt by people around the world. People tend to seeks for the way to reduce the emission of Greenhouse Gas which is the main cause of global warming as their environmental responsibility. This paper attempts to quantify Thai consumers' Willingness to Pay (WTP) for consumer products with carbon reduction label. Representative consumers were selected by sampling to participate in the experiment, using the *n*th price auction. The subjects were asked to compare the sugar and dehydrated strawberry that certified with carbon reduction label and non-label. The results showed that Thai consumers accept the consumer products that certified with the carbon reduction label, as WTP for sugar and dehydrated strawberry that has label was increased by 2.08% and 2.23% respectively from non label products.

KEY WORDS: CARBON REDUCTION LABEL / *N*TH PRICE AUCTION / WILLINGNESS TO PAY (WTP)

36 pages

ความเต็มใจในการจ่ายของผู้บริโภคไทยต่อสินค้าที่ติดฉลากลดคาร์บอน

THAI CONSUMER WILLINGNESS TO PAY FOR CONSUMER PRODUCT WITH CARBON LABEL

ภัสสรา เตธนานันท์ 5038743 ICMA/M

บธ.ม. (การวิเคราะห์และสร้างตัวแบบธุรกิจ)

คณะกรรมการที่ปรึกษาสารนิพนธ์ : นันทนา อุดมกิจ, Ph.D., ยิ่งยศ เจียรวุฒิ, Ph.D.,

บทคัดย่อ

ปัญหาภาวะโลกร้อน เป็นปัญหาที่ส่งผลกระทบต่อมนุษยชนในขณะนี้ ผู้คนทั่วโลกจึงเกิดความตื่นตระหนกเกี่ยวกับปัญหาสิ่งแวดล้อม และพยายามหาทางแก้ไขให้แก่ปัญหานี้โดยการลดก๊าซเรือนกระจกซึ่งเป็นปัจจัยหลักที่ทำให้เกินสภาวะโลกร้อน รายงานฉบับนี้จึงศึกษาถึงความเต็มใจในการจ่ายของผู้บริโภคไทยที่มีสินค้าอุปโภคบริโภคที่ติดฉลากลดคาร์บอน โดยการสุ่มเลือกตัวแทนของผู้บริโภคไทยมาทำการทดลอง ซึ่งการทดลองนี้จัดขึ้นในลักษณะการประมูลซื้อสินค้าอุปโภคบริโภค โดยใช้วิธีการแบบ *n*th price auction ในระหว่างการทดลองนั้นผู้เข้าร่วมจะต้องประมูลซื้อน้ำตาล และสตรอเบอร์รี่อบแห้ง ทั้งแบบธรรมดา แบบที่ติดฉลากลดคาร์บอน จากการศึกษาพบว่า ผู้บริโภคไทยส่วนใหญ่ให้การยอมรับฉลากลดคาร์บอน ซึ่งเห็นได้จากความเต็มใจในการจ่ายของน้ำตาล และสตรอรี่อบแห้งที่ติดฉลากลดคาร์บอนเพิ่มขึ้นจากสินค้าที่ไม่มีฉลากลดคาร์บอนถึง 2.08% และ 2.23% ตามลำดับ

36 หน้า

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

1.1 Global Warming

People around the world have acknowledged the term “global warming” for over a decade. Humans are often accused of being the main contributors to this problem. Global warming raises the temperature and causes climate change which will dramatically affect ecosystems that will, in turn, cause higher sea levels and lead to flooding in the lowlands. This problem will have an effect on almost every creature on the planet, including humans and especially those species found in places facing extreme climate change such as the Arctic and Antarctic. Polar bears, penguins and other species that live there desperately have to adapt to melting ice caps and face the problem of finding food and shelter. Climate change will build up green house gas in the earth’s atmosphere which will cause significant change in our normal ecosystems in some regions and may cause floods, storms and other extreme weather conditions. Hundreds of environmental factors join together to form a complex chain of events. The global warming problem began when the Earth’s ozone layer, (O3, a molecular form of oxygen) was depleted, which resulted in a large increase in ultra violet radiation on the surface of the earth. This caused an imbalance between harmful radiation reaching the earth’s surface and our preferred air and water temperatures.

1.2 Effects of Carbon Dioxide from the Industrial Process

According to one study, the atmospheric temperatures recorded from bubbles of air trapped from the ice of Greenland and Antarctica over the past hundred years have shown significant changes in carbon dioxide concentration; the amount of carbon dioxide concentration in the atmosphere increased by 30 percent from 1870 to 2000 (Hennessey, 2000). The more recent direct measurements that provide evidence on the increase of atmospheric CO2 have been increasing since the Industrial

Revolution. (NASA via: Climate change: Modern Atmospheric Concentrations of Carbon Dioxide NASA, accessed October 27, 2009). The temperature and carbon dioxide concentrations chart from 1880-2006 is shown as follows:

1.3 Green Marketing

The rise of environmental awareness has been felt by people around the world. People tend to seek ways to reduce the emission of greenhouse gases which is the main cause of global warming. European countries are the leaders in terms of being prepared to impose non-trade barriers. As for Asia's business scene, green marketing has been widely used by the newly industrialized countries. It is expected by the World Health Organization that in the 21st century 18 percent of all expenditures will be used as environment-related expenses and environmental concerns will become as crucial as it has been in the West (Levin, 1991).

People are now aware of links between environmental problems and their everyday consumption items, such as the goods on their local supermarket shelves (Adams, 1990; McKusick, 1990). At present, consumers cannot always identify products or services in their everyday lives and what their impact will be throughout their life cycles. Many green marketing surveys were published to identify consumer attitudes on the topic of "Increasing Environmental Concern and Willingness to Change Consumption Habits." According to the 2007 McKinsey's Survey of 7,751 residents in Brazil, Canada, China, France, Germany, India, the United Kingdom and the United States, 80 percent of the respondents claimed that they worried about the products they buy and their impact on the environment and around 33 percent were ready to pay for more expensive green products (McKinsey, 2007).

As markets become more competitive, formal marketing increase is important as to which companies can continue to grow their markets and improve their market shares. Terms like "Green Market" and "Environmental Marketing" frequently appealed to consumers in the late 1980s. The American Marketing Association (AMA) held the first workshop on "Ecological Marketing" (Polonsky: An Introduction to Green Marketing 1, in 1975). As a result of this workshop, the first green marketing book entitled "Ecological Marketing" was published (Henion and Kinnear 1976a). The

success of this book resulted in the publication of a number of other books on the same topic (Charter 1992, Coddington 1993, Ottman 1993).

Green marketing concerns have been felt by many governments around the world as they try to regulate activities (Polonsky 1994a). For example, in the United States documents on green marketing issues have been developed extensively by the Federal Trade Commission and the National Association of Attorneys-General (FTC 1991, NAAG 1990). The results of the research consistently show that consumers prefer green products, compared to those that are less environmentally friendly, all things being equal. As demands change, many corporations see these changes as an opportunity to become leaders in the field and change their business strategies to green marketing. A broad range of activities, including production process modification, product development, packaging change and advertising are required for green marketing. Green marketing can be done in a number of ways such as promoting the company's commitment to the environment and product labeling. Product labels such as the Carbon Footprint label or the Carbon Reduction label are one way to disseminate information about green products. Carbon labels aim to promote the reduction of greenhouse gases and hope to be driven by the power of consumer choice. Manufacturers can use these labels to demonstrate their commitment to the environment and their responsibility to confront climate change.

1.4 Carbon Reduction Labeling

Carbon labeling was first introduced by the UK's Carbon Trust, a not-for-profit company that started to calculate the carbon footprint of 75 products in 2006. The UK was the first country to introduce a carbon labeling scheme by introducing "The Carbon Trust's PAS2050", a draft standard for calculating a product's carbon footprint. The carbon label provides information on the greenhouse gas emission of those products with the hope that consumers will be able to make informed purchasing decisions. The concept of a carbon label is to show the reduction of CO2 emissions in the industrial process of a specific product. The degree of reduction shown on the label is determined by electricity usage, fossil usage, and pollution throughout the product's life cycle assessment. The evaluation will be calculated by a carbon dioxide equivalent

per one pack of product since its production, which includes raw material, the manufacturing process, distribution and retail, usage and disposal.

The carbon label can be divided into two types. In the first type the product is evaluated from the cradle to the grave, including production, delivery, usage and the recycling process. The second type only evaluates the production process from the producer to the end user. Some examples are shown in Figure 1.1. Internationally, carbon issuing organizations in each country are independent; each country will set up an organization which is responsible for setting the rules and regulations on issuing the label. Each country will have different rules and regulations based on referenced document such as BS EN ISO 14021, Environmental labels and declarations – Self-declared environmental claims, (Type II environmental labeling), BS EN ISO 14044:2006, Environmental management –Life cycle assessment – Requirements and guidelines, ISO/TS 14048:2002, Environmental management –Life cycle assessment – Data documentation format, etc.

European carbon label indicate in unit of grams of carbon emission per unit

Thailand carbon reduction label that show the carbon reduction in percentile per unit

Mitrpol Sugar Carbon Reduction Label

Figure 1.1 The samples of carbon labels using in European countries and Thailand

Source: TGO (Thailand Greenhouse Gas Management Organization). (http://www.tgo.or.th/index.php?option=com_content&&task=category&&sectionid=8&&id=31&&Itemid=74)

Carbon labeling was launched in Europe with initiatives in France, the UK and Sweden in 2007 by the Carbon Trust. The UK's first carbon footprint program started with Tesco Plc., the UK's biggest retailer, which began to label its 20 own-brand products. The carbon footprint labeling was based on the life cycle assessment in late April, 2007 (UK Environmental Department). After that, more than 150 companies expressed their interest in the Carbon Trust scheme across almost every industry.

In the US, the 'Certified Carbon Free' label was developed by the Carbon Fund, an independent not-for-profit carbon offset provider in collaboration with the Edinburgh Center for Carbon Management. The label was used with 6 pilot consumer products based on the ISO Life Cycle Assessment Standards, the GHG Protocol and the UK Carbon Trust's (2007) Carbon Footprint Measurement Methodology.

In Asia, the Japanese government set up a carbon footprint labeling system in coordination with the Japanese Ministry of Economy, Trade and Industry (METI), which began in April, 2009. The policy implementation of the carbon footprint label in Japan is of interest to industries and viewed as a radical and challenging system. The China Energy Conservation Investment Corporation (CECIC) is also working with the Carbon Trust on a series of feasibility studies to assess the PCF of Chinese businesses and products. As for Thailand, the Thailand Greenhouse Gas Management Organization (TGO), a public organization, launched a carbon label project in August, 2008, by appointing a Carbon Label Committee to supervise the administration of carbon labeling. In the first stage of labeling, TGO will provide the second type of carbon labels which evaluates only the production process.

To acquire approval for carbon labeling, the manufacturer must reduce the CO_2 emissions in the production process by 10% from the degree of 2002, compared to the recent year. All production processes in both the base year and recent year must be submitted to the committee to evaluate the degree of CO_2 emission in both years. The manufacturer must set up the criteria for the exclusive use of power consumption, fossil fuel consumption and waste management. The electricity supply in manufacturing should be generated on-site from biomass residues or from industrial waste while the consumption of electricity purchase from outside must be less than 5% of total power requirement. In the manufacturing facility, fossil fuel is not allowed to

be used except for boiler or gas engine start ups. The firm should manage its waste properly so that there are no greenhouse gas emissions. The technology that the industry brings in to reduce the carbon emissions, by comparing it with others in the same industry, should be investigated by the Carbon Label Committee on a case-by-case basis. At the first stage of labeling registration, manufacturers need to estimate the carbon emissions released through the production process in the base year and compare it with the recent year which shows that the emission is reduced by at least 10 percent; then the manufacturers can register for a carbon label. The labels will be valid for only 3 years after being issued. The manufacturer needs to register again after their expiration. Registration fees of THB 100,000 are required for issuing the carbon label per one product. (Thailand Greenhouse Gas Management Organization, (2010))

Carbon labeling is one way for individuals, organizations and businesses to neutralize and take responsibility for global warming implications that come from their everyday work and lifestyles. In addition, consumers can express their concern for the environment through their purchasing behavior by reacting to products in terms of their being carbon neutral. As for producers, carbon labeling can demonstrate their commitment to fighting global warming by managing and reducing carbon emissions in production. Producers can also benefit from power efficiency through renewable energy, waste minimization and the reduction of fossil fuel consumption. Apart from that, carbon labeling can offer a competitive advantage that can be further developed with key consumers. As of April 27, 2010, 66 products in Thailand have carbon reduction labels, among which are One Touch Condom, Mitrpol sugar and TPI cement. Moreover, 15 pilot companies in Thailand’s retail market are carbon offset provider, such as Siam Cement Group, Mitrpol Co.Ltd., TPI PLC., Coca-Cola Thailand and Thai President Food PLC.

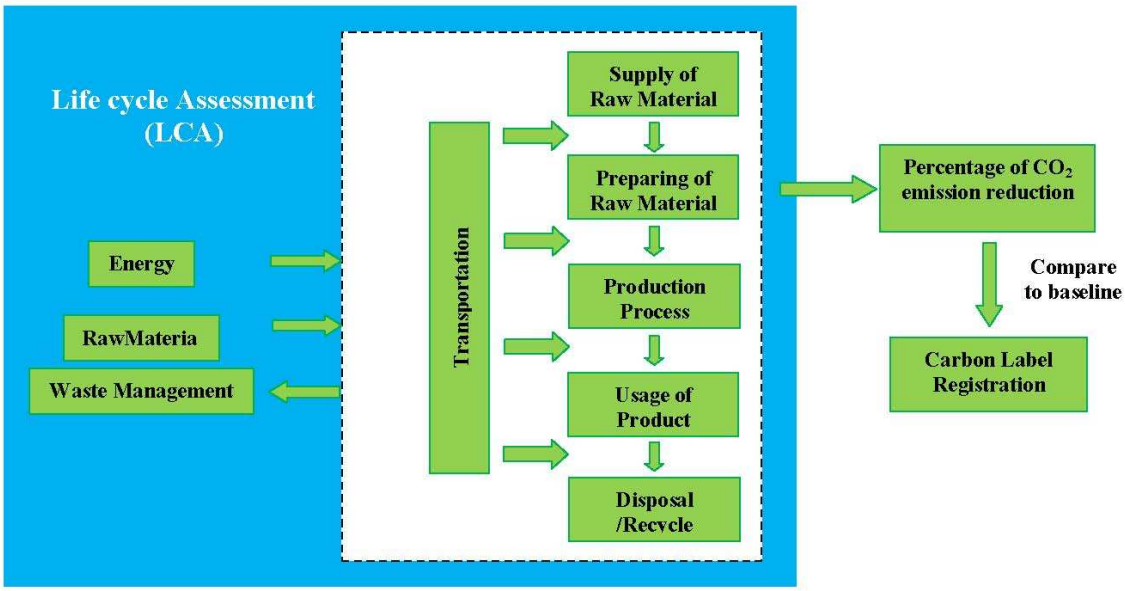

Figure 1.2 The Procedures of carbon labeling in Thailand

Source: TGO (Thailand Greenhouse Gas Management Organization). (http://www.tgo.or.th/index.php?option=com_content&&task=category&&sectionid=8&&id=31&&Itemid=74)

1.5 Study Objectives

The objective of this study is to determine Thai consumers' perspectives and willingness to pay for carbon labeled products. This study will lead to the access of factors contributing to consumers' behavior or attitudes by comparing demand or willingness to pay for carbon labeled products and non-labeled products.

1.6 Scope of the Study

This research was conducted with a sample of 40 people, who are representative of Thai consumers from different ages, areas, degrees of education and income. The consumer products used in this study are: packs of sugar with and without carbon labeling and dehydrated strawberries with and without carbon labeling.

1.7 Limitations

This study included only 40 subjects, a relatively small and not randomized sample size that cannot actually represent the entire Thai population. Also, most of the subjects are from the same region, namely Salaya, Nakornpathom, which may have an effect on the diversity of the subjects' backgrounds.

CHAPTER II
LITERATURE REVIEW

2.1 Consumer Perception toward Environmentally Friendly Products

Studies on consumer perception toward environmental friendly products have been conducted for over a decade. It seems that almost every month a new study or survey is published. Some studies suggested that “The social marketing concept holds that the organization’s task is to determine the needs, wants, and interests of target markets and to deliver the desired satisfactions more effectively and efficiently than competitors in a way that preserves or enhances the consumer’s and the society’s well-being” (Kotler, 1997, p. 27).

“Environmental segmentation alternatives: a look at green consumer behavior in the new millennium” by Straughan et al. (1999), examines the nature of ecologically conscious consumer behavior. The study used demographic variables such as age, income, race, place of living and self-reported measures of environmental concerns as main indicators of an individual’s propensity to engage in consumer behavior about ecological issues. The study used a questionnaire administered to a sample of 235 students at a major university and used the regression method between demographic and psychographic variables as predictors to ecologically conscious consumer behavior. When considered individually, demographic predictors added in the mode, like age, sex and classification, were significantly correlated with 32.8 percent of the variance in environmental consumer concerns.

In the study, “Promoting Carbon Footprint Labeling in Regard to Climate Change in Korea” by Young Lee (2009), carbon footprint labeling in Korea did not offer satisfactory results even though it was beneficial to the environment because it did not specify direct benefits to both manufacturers and consumers. On the other hand, the economic incentives provided to facilitate the promotion of carbon labeling have led to a spread of a consumer culture for low carbon steel products.

Getzner et al. (2003) conducted the study, “Consumer preferences and marketing strategies for “green shares” specifics of the Austrian market”. The study focused on “green shares” or investment funds of companies which have environmental friendly policies. The study explored consumers’ willingness to invest in “green shares”, (shares and investment funds with environmental criteria for investment) in December, 2001, in a Computer Aided Telephone Interview (CATI). Moreover, the reliability and validity of a survey of 400 Australian investors concluded that there are a significant number of Australian consumers willing to invest in green shares while there might be a similar demand on other “green” consumer products. From the findings, higher education and above-average income were identified as the characteristics of environmentally aware consumers. The results referred to the question of which group of consumers favored investing in “green shares.”

A study on consumer perspectives and behavior towards ecological concerns in the lodging industry in India by Manaktola and Jauhari (2007), focused on the factors which influence consumers’ attitudes and willingness to pay. The study was carried out in the National Capital Region of Delhi, Gurgaon and Noida, on a sample size of 66 respondents by using a structured questionnaire, which was developed to determine the attitudes and behavior of consumers on green practices. Broad consumer behavior on the choice of environment friendly hotels found that the majority of respondents favored green practice hotels. But when it came to the willingness to pay for green practice lodging, the majority of respondents felt that the hotels themselves should be responsible for the cost of environmental friendly practice by having 40 percent of consumers who were willing to pay for environmental initiatives for a 4-6 percentage of overall cost.

In order to explain variations of college students’ environmental conscious consumer behavior, psychographics appear to be more significant than demographics, as in “Environmental segmentation alternatives: a look at green consumer behavior in the new millennium” by Straughan (1999). The multiple and step-wise regressions were used in this research to examine the significance of the relationships between current results and past research on a profile of ecologically conscious consumers. The results indicated that the ecological consciousness of individuals alone cannot drive

behavior. Individuals will be more likely to take action when they feel that they are effective in combating environmental problems. Even though the factor that significantly correlated with conscious consumer behavior was liberalism, this type of behavior appeared to transcend ideological boundaries. Altruism was also found to have an influence on ecologically conscious consumer behavior.

Using the sampling procedures and data collections targeting the population in a North-America city, Laroche et al. (2001) studied targeting consumers who were willing to pay more for environmentally friendly products. The findings concluded that from a total of 2,837 participants, consumers who consider environmental issues when making a decision on purchasing were more likely to spend more for environmental friendly products. Other studies also state that consumer willingness to pay more for environmental friendly products is strong enough to warrant marketers' attention (Coddington, 1990).

Research on consumer perceptions of "green" power, asking participants "how much extra would you be willing to pay on your electricity bill each month to ensure that all the electricity you use comes from a "green" source?," demonstrated the correlation between stated amounts of premium willingness to pay for green power and the belief of participants that particular energy resources should be labeled "green". This finding can explain that the levels of premium consumers willing to give are differentiated from the resource of power (Rowlands , 2002).

Research on consumers' purchasing behaviors and perceptions towards environmentally harmful products in Hong Kong was conducted by using a survey instrument to measure the level of consciousness towards certain environmentally sensitive issues. The findings stated that Hong Kong consumers do not reflect on their purchase behavior in terms of environmental concerns. No relevant and strong relationship was indicated between self-perception on the environmental impact of seven products and purchasing behavior in terms of consideration before buying.

A study on consumer behavior and environmental quality also took place in Hawaii, a state that is free from man-made pollution, with a reputation for clean air. Choy et al. (2009) used a survey instrument on a non-random sampling of 350 Hawaii residents who own non-hybrid autos. The research showed the consumers were aware of environmental problems and were willing to improve environmental quality. The

consumers also stated that they expected government intervention on environmental friendly legislation such as tax incentives for both users and car producers of hybrid cars and related products.

Olson (2009) stated in his findings that the way to help organizations of all sizes better identify and prioritize new opportunities was to push their enterprises to improve environmental stewardship. It seems that when businesses are indentified with and take action on improving the environment, they simultaneously improve their own business performance as well.

In the research on qualitative insights into green consumer behavior by Tadajewski (2006), a test group of a wide range of green consumers in the UK and Germany was chosen to engage in interviews concerning their environmental concerns and consumers' problem-solving behavior. The research suggested that in order to persuade consumers to move from their intention to purchase to their actual purchasing of green products, the strategies on environmental communication should aim to overcome the barriers that impinge on consumer cognition.

CHAPTER III
METHODOLOGY

The carbon label has now introduced in most developed and developing country over the world. For Thailand, it still unknown whether it is worth for both consumers and manufacturers in all procedure leading to carbon labeling on the product or not. Many studies have done over the world about the willingness of consumer to pay for environmental friendly product, but for Thailand consumers perception, it still unknown. The procedures in study of the willingness to pay can be done by 2 methods, survey and experiment. In this paper, we'll choose the *n*th price auction which similar to the method of Van Wechel et al. (2003), Huffman et al. (2003), and Rousu et al. (2004). The reason that we choose the *n*th price auction method is that it is the effective way to stimulate all participants' involvement. The *n*th price auction will let participants have a chance to win on any price they bid. By this way, the participants would reveal their true willingness to pay for specific product. Refer to the sample size chose by Lusk et al. (2001), Noussair et al. (2002) and Huffman et al. (2003,2007) as shown in Table 1, we choose a group of 40 participants to participate in this auction.

Table 3.1 The sample sizes of the previous researchers

	Number of participants (persons)	The number of sessions	The size per session. (persons)
Lusk et al.(2001)	50	2	18 and 32
Noussair et al.(2002)	112	16-22	5-7
Huffman et al. (2003,2007)	172	12	Less than 16

This paper aims to examine the willingness to pay for products with carbon reduction labels in Thailand by conducting an experiment at Mahidol University, Salaya, Nakornpathom. The experiment was conducted with a group of 40 participants, over 20 years old, who represented Thai consumers. The experiment was divided into 4 sessions, with 10 participants allocated to each section. Each participant bid an amount of money to demonstrate the intensity of preference between subjects in a closed room. The announcement of this experiment was done through invitational posters in specific areas in Salaya, Nakornprathom. The content of the invitational posters explained that it was general research on consumer products funded by the government, thereby preventing any participants to prepare themselves before the actual experiment which might affect their real willingness to pay. The participants who were willing to participate in the experiment could contact the researcher directly via telephone or email and would be informed of the appointed date and place for the experiment. On the day of the experiment, the participants had to sign contracts in front of the auction room stipulating that they were not reluctant but rather were willing to participate. All participants received 500 Baht and were allowed to use this amount of money to buy actual products if they were the winner of the auction. The participants were seated at separate tables and were provided with an auction information sheet and details of the auction's procedures; they were also allowed to ask questions before the auction began. After having been duly informed, participants were given the opportunity to withdraw from the experiment if they so chose. Each subject was not allowed to reveal his or her actual name in the experiment; instead they randomly selected the A to J alphabet letters in order to conceal their identities.

The auction was divided into 4 rounds; the first two were trial rounds. The participants were presented with three products: bottles of cooking oil, packs of batteries and salt. They then proceeded to offer the price they were willing to pay for these products which were submitted on sheets of paper. These two training rounds enabled the subjects to become accustomed to the nth price auction and its process. After the researcher collected the auction sheets from each participant, the envelopes were opened and the bids were written on the board. They were ranked from the highest to the lowest. The researcher then randomly selected the decision number which ranged from 2 to 10. The winners would be those subjects who offered bids

between the highest to the last highest decision number which implies that each round might have more than one winner. For example, if the decision number was 6, the five highest bidders would have to buy the goods at the sixth bidder's price. The second training round was carried out in the same way as the first round, during which the subjects bid for two products, a pack of batteries and salt. The subjects were once again able to ask question if they had any doubts about the process of the experiment; then the real experiment commenced. After the trial rounds, two consumer products were used in the experiment, namely, bags of sugar and packs of dehydrated strawberries. The products showed only the description of ingredients, size and name of the product. The participants bid on the non-label products in the first round. In the second round, the participants bid on the same products, only this time with the carbon labels. All bidding rounds and sample of the label of each product are shown in the table 3.2 and figure 3.1.

Table 3.2 Sequence of an experimental session

Round	Description
Training Round 1	Auction for a cooking oil
Training Round 2	Auction for a pack of battery and a bag of salt
Actual Round 1	Auction for a sugar and dehydrated strawberry without Carbon Reduction label
Actual Round 2	Auction for a sugar and dehydrated strawberry with Carbon Reduction label

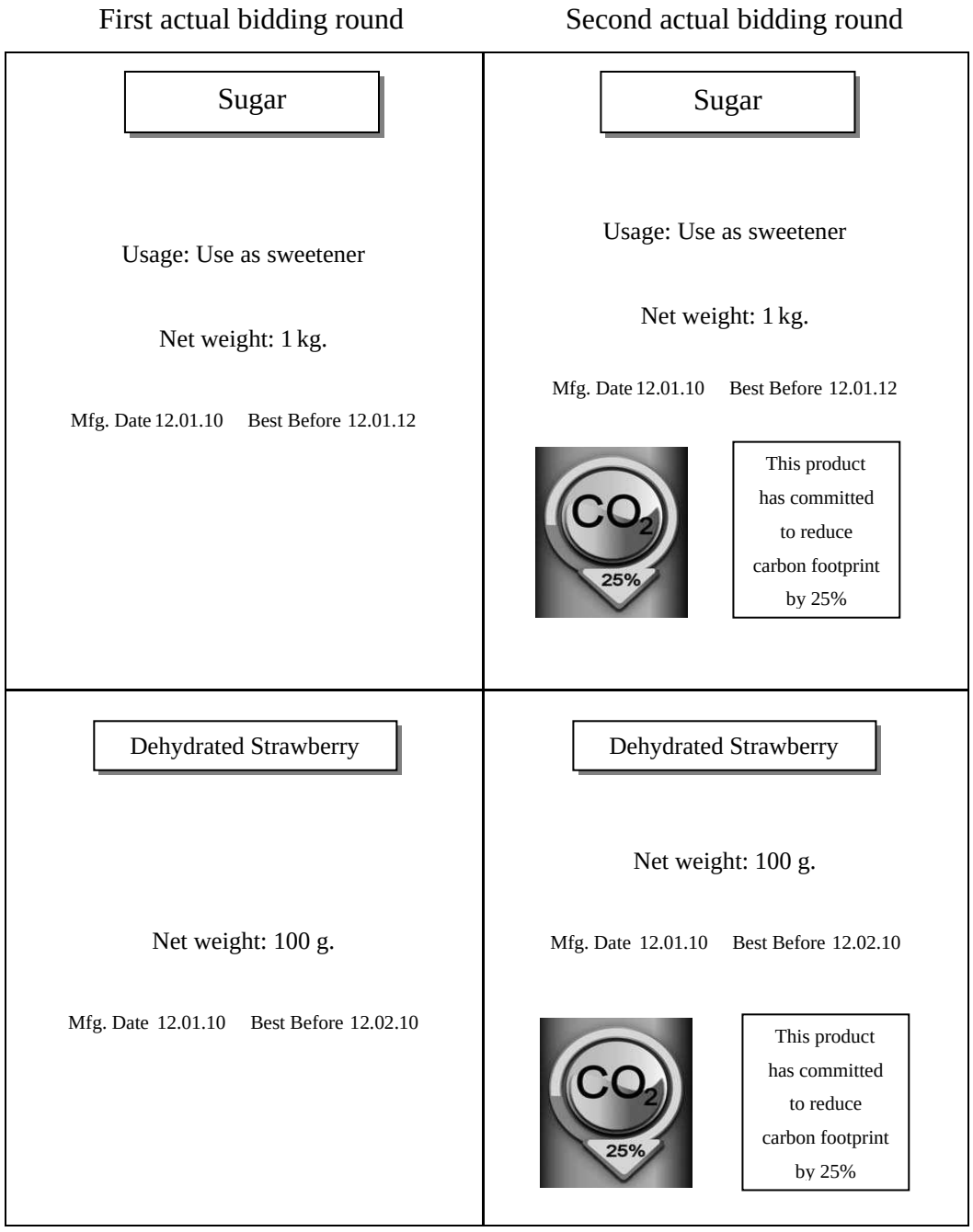

Figure 3.1 The example of the products label on each round listed as follow:

In this experiment, we divided the participants into two groups: 20 participants from the first two sessions and another 20 participants from the third and forth sessions. The subjects in the first group were given information sheets about the benefits of carbon-labeling before bidding began; the other group bid on the same

product without being informed of any benefits. Finally, the collected data was used in the data analysis based on censored regression to find the correlation between bidding prices and participants' information.

After the experimental auctions, all the subjects had to fill in questionnaires that asked about personal information, shopping behavior, their perspectives toward carbon reduction labeling and background knowledge. The demographic characteristics of the subjects are shown in Table 3.3. According to the questionnaires, the subjects had an average age of 31.48 years old with a standard deviation of 4.99 years. Most participants were female with bachelor degrees or higher and an average income of 10,000 to 24,999 Baht per month. The average family size was 4.83 people, with sixty percent of participants as the main shoppers for their families. The questionnaire revealed that attitudes toward environmental friendly labeling, on a scale from not important or 1 to very important or 5, was average at 2.65 and the frequency of reading a product's label before buying was average, at "sometimes". As for self-reported knowledge of the carbon reduction label question, the subjects only had some knowledge.

Table 3.3 Demographic characteristics of subject

Variable	Definition	Mean (SD)
Age	Age of participants	31.48 (4.99)
Sex	Male = 1, Female = 0	0.30 (0.46)
Degree of education	Bachelor degree or higher =1, Otherwise = 0	0.88 (0.33)
Income	Below Baht 5,000 = 1, Baht 5,000 – 9,999 = 2, Baht 10,000 – 24,999 = 3, Baht 25,000 – 49,999 = 4, Baht 50,000 – 99,999 = 5, Baht 100,000 and higher = 6	3.03 (0.70)
Household	Number of members in subject's household	4.83 (1.78)
Shopper	Main shopper = 1, Otherwise = 0	0.63 (0.49)

Table 3.4 Definitions and summary statistics of attitudinal variables

Variable	Definition	Mean (SD)
Environmental Friendly	Important of environmental friendly of product [Scale from 1 to 5; not important at all =1, very important = 5]	2.65 (0.62)
Reading Label	Frequency of reading food label before buying [Always = 5, Often = 4, Sometimes = 3, Rarely = 2, Never = 1]	3.25 (0.74)
Self-reported Knowledge	Self-reported Knowledge of Carbon label [High knowledge = 3, Some knowledge = 2, No knowledge = 1]	2.03 (0.58)

Note: The data does not include "Don't know" or "Not sure" choices

CHAPTER IV
RESULTS AND ANALYSIS

4.1 WTP for Products with Carbon Reduction Labels

The results of the experiment of the willingness to pay for consumer products with and without carbon reduction labels show that Thai consumers have a positive perspective towards products with carbon reduction labels. The results also show the positive amount that consumers are willing to pay for sugar that is certified with a carbon reduction label; the average bid for sugar with carbon reduction labels was 18.65 Baht, an increase of 2.08 percent compared to those with no labels which had an average bid of 16.58 Baht. The significant p-value of 0.000 with t-test statistics of 6.029 in paired sample correlations of the product also prove that the label had an effect on the amount stated by participants in the test group as you can seen in Table 4.1 and Table 4.2.

A majority of the participants had positive attitudes toward carbon reduction labels and the percentage of favorable consumers whose bids for the products with carbon reduction labels higher than the non-label products was 72.5 percent. This group can be classified as favorable consumers who are willing to pay more for a product that is certified with a carbon reduction label. Another 25 percent of the participants were indifferent consumers, who had neutral perceptions about carbon reduction labels and only 2.5 percent were reluctant consumers who had a negative attitude toward the labelsl. Moreover, when we classified consumers' attitudes towards carbon reduction labels into four types, the results were more clearly understood when only increasing bids (favorable consumers) were considered. The average bid for sugar with the label would be 18.72 Baht, a consumer's WTP increase of up to 2.93 percent.

Table 4.1 Comparison between Sugar with Carbon Reduction label and without label

	Number of bidders	**Percentages**
Number of all bids	40	-
Decreasing bids for Sugar	1	2.50%
Increasing bids for Sugar	29	72.50%
Equal bids for Sugar	10	25.00%
Zero bid for Sugar	0	-
Average bid for Sugar with Carbon Reduction label (in THB)		18.65
Average bid for Sugar without Carbon Reduction label +(in THB)		16.58
Average bid for Sugar with Carbon Reduction label only increasing bid (in THB)		18.72
Percentage increase for Sugar with Carbon Reduction label		2.08 %
Percentage increase for Sugar with Carbon Reduction label (only increasing bids)		2.93%

Table 4.2 T-Test statistics at 95% confidence for different labels of Sugar

	t	**P-value**
Difference between an average bid for "Carbon Reduction label" and a "non label"	-6.029	0.000

Consequently, Thai consumer WTP for dehydrated strawberries with carbon reduction labels also had a positive result since sugar had a 2.23 percent increase from the average bid of dehydrated strawberries with and without carbon reduction labels of 15.65 Baht and 13.43 Baht, respectively. This percentage can be confirmed by t-test statistics of -4.845, and the p-value is less than 0.05, so the null hypothesis of no difference between average bids for dehydrated strawberries with and without carbon reduction labels is not acceptable. Seventy five percent of increasing bids confirmed that most consumers in the test group were favorable towards products

with carbon reduction labels, with only 20 percent who had equal bids as shown in Table 4.3 and Table 4.4. Focusing only on increasing bids, the average bid for dehydrated strawberries with labels would be 15.10 Baht or a 3.27 percent increase.

Table 4.3 Comparison between dehydrated strawberry with Carbon Reduction label and without label

	Number of bidders	Percentages
Number of all bids	40	-
Decreasing bids for dehydrated strawberry	2	5.00%
Increasing bids for dehydrated strawberry	30	75.00%
Equal bids for dehydrated strawberry	8	20.00%
Zero bid for dehydrated strawberry	0	-
Average bid for dehydrated strawberry with Carbon Reduction label (in THB)	15.65	
Average bid for dehydrated strawberry without Carbon Reduction label (in THB)	13.43	
Average bid for dehydrated strawberry with Carbon Reduction label only increasing bid (in THB)	15.10	
Percentage increase for dehydrated strawberry with Carbon Reduction label	2.23 %	
Percentage increase for dehydrated strawberry with Carbon Reduction label (only increasing bids)	3.27%	

Table 4.4 T-Test statistics at 95% confidence for different labels of Strawberry

	T	P-value
Difference between an average bid for "Carbon Reduction label" and a "non label"	-4.845	0.001

4.2 Consumers' WTP with Information about Carbon Reduction labels

Focusing on the test groups that were given information before bidding and the groups with no information, the average results of both products showed a significant increase of 2.35 percent compared with the group with no information, with an average increase in bidding of 1.9 percent. But when we used the T-Test to prove whether consumers with more knowledge about carbon reduction labeling and its benefits were willing to pay more for those products or not, the results demonstrated that there was no difference between the two groups since the p-value for sugar and dehydrated strawberries was 0.582 and 0.131, respectively, as shown in Table 4.5.

Table 4.5 T-Test statistics at 95% confidence for different groups that have information and don't have information

	t	**P-value**
Difference between an average bid for sugar with and without label compare between the groups that information has been given and has not been given.	0.649	0.520
Difference between an average bid for dehydrated strawberry with and without label compare between the groups that information has been given and has not been given.	-1.377	0.177

4.3 Demographics and attitudinal influences

According to the results, participants with different demographics and attitudes tended to make variable bids. We used the Ordinary Least Squares (OLS) method to find the factors that influenced each bid, see Table 4.6. The information on participants from the questionnaires was analyzed when the dependent variable was the bid difference between the "Consumer Products with Carbon Reduction Label" round and the "No Label" round. The higher bid difference meant that higher concerns about environmental problems and the effect of labeling influenced consumers' willingness to pay.

Table 4.6 The relationship between demographic and attitudinal information and bid values of dehydrated strawberry

Variable	**Coefficient**	**t-Statistic**	**Prob.**
AGE	0.125214	1.005454	0.323289
SEX	0.507054	0.409658	0.685174
EDUCATION	-1.35925	-0.66554	0.511154
Monthly Income (10,000-24,999)	-0.24397	-0.14302	0.8873
Monthly Income (25,000-49,999)	-1.66759	-0.68153	0.501133
Monthly Income (50,000-99,999)	-1.90711	-0.49846	0.622051
HOUSEHOLD	0.360791	1.129339	0.268338
SHOPPER	0.81077	0.598629	0.554233
ENVIRONMENTAL CONCERN	1.028346	1.051349	0.302088
READLABEL	-0.66025	-0.84784	0.403719
SELF-KNOWLEDGE	-0.03416	-0.0381	0.969875
R-squared	0.175098		
Adjusted R-squared	-0.14897	F-statistic	0.540313

Note: * P-value < 0.05 ** P-value < 0.10

When considering the demographics of the participants, there don't have any factor that could reasonably explain the willingness to pay for consumer products that were certified with the carbon reduction label for both products.

Table 4.7 The relationship between demographic and attitudinal information and bid values of sugar

Variable	**Coefficient**	**t-Statistic**	**Prob.**
AGE	0.000607	0.000892	0.680075
SEX	0.00231	0.008868	0.260508
EDUCATION	-0.009	0.014633	-0.61538
Monthly Income (10,000-24,999)	-0.00726	0.012222	-0.59422
Monthly Income (25,000-49,999)	-0.02019	0.017531	-1.15185
Monthly Income (50,000-99,999)	-0.02188	0.027412	-0.79824
HOUSEHOLD	0.004141	0.002289	1.808996
SHOPPER	0.002733	0.009704	0.28161
ENVIRONMENTAL CONCERN	0.004496	0.007008	0.64153
READLABEL	-0.00455	0.00558	-0.8161
SELF-KNOWLEDGE	0.001404	0.006424	0.218524
R-squared	0.246087		
Adjusted R-squared	-0.05009	F-statistic	0.830869

Note: * P-value < 0.05 ** P-value < 0.10

CHAPTER V
CONCLUSION

Using the *n*th price auction, the results showed that Thai consumers are willing to pay more for products that are certified with carbon reduction labeling, as the WTP for sugar with a carbon reduction label increased by 2.08 percent from the non-label sugar with a 2.07 Baht premium. Dehydrated strawberries enjoyed the same results with an increasing bid of 2.23 percent or a 2.22 Baht increase from non-label strawberries.

When we focus on the difference between the test groups when information had or had not been given, there was no difference on the bid results for both sugar and strawberries. From the results, the P-value of sugar and strawberries showed the non-significant value at 0.520 and 0.177, respectively. This demonstrates that even though the subjects had knowledge about the benefits of the label, they still were willing to pay the same amount as the group that didn't have any knowledge about it.

The collected demographics and attitudes of participants were used for analysis by using the Ordinary Least Square method. The findings showed that three factors that influenced each bid were income, self-knowledge and households.

This study showed that investing in a carbon reduction label program is a good opportunity for producers since they will be able to sell their products at a higher price and simultaneously represent corporate social responsibility on environmental problems. Corporations also have a chance to differentiate their products from competitors and be seen as leaders in their area. Moreover, producers will increase their competitiveness not only in the local market but also in the international market, particularly since the carbon footprint label will become more recognized by EU nations, including France which recently issued new legislation, effective next year, that calls for all products placed on shelves to have carbon footprint labeling.

In terms of the Thai government, it should reduce the cost of all procedures leading to carbon reduction labeling to support and enable producers to participate in

this program more easily. The government might set a program, such as providing tax incentives for corporations to help them reduce the cost of bringing in new technology and all procedures leading to product labeling. Without government support, clean products would be far more expensive than other carbon intensive products. In this way corporations might be able to participate in the program more easily and enjoy its benefits in both domestic and international trading. Also, the corporate production plan needs to be improved in order to meet the requirements for carbon reduction labeling. The government should provide more knowledge to support producers with new technology or machines in order to acquire a carbon reduction decrease in production. The government should also find ways to promote carbon reduction labeling to Thai consumers so they can be more knowledgeable about this issue and its benefits to the environment. Price is also an important issue with which producers should be carefully concerned. It can be set at a premium but should not be too much higher than non-label products; producers can use this study's results as a guideline. Communication with consumers is also important in order to drive change in market behavior. There are many ways that producers can communicate with the public, such as on-package labeling, in-store POS, and brochures.

REFERENCES

Adams, R. (1990). *The Greening of Consumerism.* Accountant, June, 82-83.

Bangkok Post (2010, Dec 11) *Food Exporters Need Carbon Footprint Labels.*

Carbon Trust Footprint company. *The Carbon Reduction Label (2010)*. Retrieved from http://www.carbon-label.com.

Choy et al. (2009). *Consumer Behavior and Environmental Quality in Hawaii*.

Federal Trade Commission (FTC). 1991. *Hearing on Environmental Marketing Issues*

Getzner et al. (2003). *"Consumer preferences and marketing strategies for "green shares" specifics of the Austrian market"*.

Hennessey, K. (2000). *"Climate Change"*, CSIRO, Melbourne.

Huffman, W.E., Shogren, J.F., Rousu, M., & Tegene, A. (2003). Consumer willingness to pay for Genetically Modified Food Labels in a Market with Diverse Information: Evidence from Experimental Auctions. *Journal of Agricultural and Resource Economics*, 28(3), 481-502.

Kotler, P. (1997). *"Marketing Management: Analysis, Planning and Control"*, 9th edition, Englewood Cliffs, Prentice Hall, New York. P 27.

Laroche, M, Bergeron, J & Barbaro-Forleo, G 2001. 'Targeting consumers who are willing to pay more for environmentally friendly products', *The Journal of Consumer Marketing*, vol. 18, no. 6, pp. 503-19.

Levin, M. (1991). Beware the green tide, *Journal Asian Business,* April, p. 58.

Levin, G. (1990). Consumers turning green: JWT survey. *Advertising Age*, 61, 74.

Lusk, J.L., Daniel, M., Mark, D., & Christine, L. (2001). Alternative Calibration and auction Institutions for Predicting Consumer Willingness to Pay for Nongenetically Modified Corn Chips. *Journal of Agricultural and Resource Economics*, 26(1),40-57.

Lusk, J.L., Traill, W.B., House, L.O., Valli, C., Jaeger, S.R., Moore, M., & Morrow, B. (2006). Comparative Advantage in Demand: Experimental Evidence of Preferences for Genetically Modified Food in the United States and European Union. *Journal of Agricultural Economics*, 57(1), 1-21.

Manaktola and Jauhari (2007). *"consumer attitude and behavior towards green practices in the lodging industry in India"*

Mckinsey (2007). *"Percentage of consumers will to pay more for energy-efficient and environmentally friendly product"* Retrieved from http://www.mckinsey. com/clientservice/sustainability/pdf/A_Compelling_Global_Resource.pdf.

McKusick, T. (1990). "Third wave environmentalism" *Utne Reader*, 42, 26-28.

NASA (2009). *" Climate change: Modern Atmospheric Concentrations of Carbon Dioxide NASA"* Retrieved from http://earthobservatory.nasa.gov/ Experiments/PlanetEarthScience/GlobalWarming/GW_Movie5.php

National Association on Attorneys-General (NAAG). 1990. The Green Report: Findings and Preliminary Recommendation for Responsible Advertising [San Francisco], USA: National Association of Attorneys-General.

National Metal and Materials Technology Center. *"What is Carbon-Label"* Retrieved from http://www.mtec.or.th/ecodesign2010/index.php?option=com content & view=article&id=8:carbon-label-&catid=1:-ecodesign&Itemid=5.

Noussair, C., Robin, S. & Ruffieux, B. (2002). Do consumers not care about biotech foods or do they just not read labels?. *The Economics Letter*, 75, 47-53.

Noussair, C., Robin, S. & Ruffieux, B. (2004). Do consumers really refuse to buy Genetically Modified Food?, *The Economic Journal*, 114, 102-120.

Olson (2009). *"In the journal of business strategy in business as environmental steward: the growth of greening"*

Ottman, Jacquelyn. 1993. Green Marketing: Challenges and Opportunities for the New Marketing Age. Lincolnwood, *Illinois: NTC Business Book*.

Polonsky, Michael J. 1994a. "Green Marketing Regulation in US and Australia: *Australian Checklist: "Green Management International* 5: 44-53.

Rowlands (2002) *"consumer perception of green power"*

Straughan et al. (1999) *"Environmental segmentation alternatives: a look at green consumer behavior in the new millennium"*

Tadajewski (2006), *"Anthropology and consumer research: qualitative insights into green consumer behavior"*

Thailand Greenhouse Gas Management Organization (Public Organization). *"Carbon Label"* Retrieved from http://www.tgo.or.th/index.php? option=com_ content&&task=category&&sectionid=8&&id=31&&Itemid=74.

Thailand Environment Institute. *"Experiencing Carbon Label" (2009).* Retrieved from http://www.tei.or.th/carbonreductionlabel/index.html

UNFCCC (United Nations Framework Convention on Climate Change) (2002a), *"The Kyoto Protocol"*, retrieved from www.mct.gov.br/clima/ingles/quioto/ signata.html.

Yam-Tang(1998). *"purchasing behaviors and perceptions of environmentally harmful products"*

Young Lee (2009). *"The Promoting Carbon Footprint Labeling in Regard to Climate Change in Korea"*

APPENDICES

APPENDIX A
QUESTIONNAIRE (ENGLISH VERSION)

"Thai Consumer Willingness to Pay for Consumer Products with Carbon Reduction Label"

(1) Age _____

(2) Sex ☐ Male ☐ Female

(3) Education ☐ Secondary School ☐ Diploma
☐ Bachelor Degree ☐ Master Degree
☐ Other _____

(4) Income
☐ < 5,000 Baht ☐ 5,000 – 9,999 Baht ☐ 10,000 – 24,999 Baht
☐ 25,000 – 49,999 Baht ☐ 50,000 – 99,999 Baht ☐ more than 100,000 Baht

(5) How many people in your family? _____

(6) How many children (under 18) in your family? _____

(7) Are you the main shopper for your household? ☐ Yes ☐ No

(8) Degree of environmental friendly of product is important when you decide to purchase a product?
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

(9) How often do you read the label before purchasing rice?

☐ Always ☐ Often ☐ Sometimes

☐ Hardly ☐ Never

(10) How much do you understand about Environmental Friendly Label or Carbon Reduction Label?

☐ Absolutely understand ☐ Pretty understand ☐ Do not understand

APPENDIX B
QUESTIONNAIRE (THAI VERSION)

แบบสอบถามความเต็มใจในการจ่ายต่อสินค้าที่ติดฉลากลดคาร์บอน

(1) อายุ _____ ปี

(2) เพศ ☐ ชาย ☐ หญิง

(3) การศึกษา ☐ มัธยมศึกษา ☐ ปวช. หรือ ปวส. ☐ อนุปริญญา
☐ ปริญญาตรี ☐ ปริญญาโท ☐ อื่นๆ _____

(4) รายได้ต่อเดือน
☐ ต่ำกว่า 5,000 บาท ☐ 5,000 – 9,999 บาท ☐ 10,000 – 24,999 บาท
☐ 25,000 – 49,999 บาท ☐ 50,000 – 99,999 บาท ☐ 100,000 บาท ขึ้นไป

(5) การทำงาน
☐ งานประจำ ☐ งานชั่วคราว ☐ ไม่มีงานประจำและชั่วคราว ☐ นักศึกษา

(6) ขนาดของครอบครัว (รวมตัวท่าน) _____ คน

(7) ท่านเป็นผู้จับจ่ายซื้อสินค้าอุปโภคหลักสำหรับครอบครัวหรือไม่ ☐ ใช่ ☐ ไม่ใช่

(8) ท่านให้ความสำคัญต่อฉลากรับรองความเป็นมิตรต่อสิ่งแวดล้อมที่มากกว่าในการเลือกซื้อสินค้าอย่างไร
☐ สำคัญมากที่สุด ☐ สำคัญมาก ☐ ปานกลาง ☐ สำคัญน้อย ☐ ไม่สำคัญ

(9) ในการเลือกซื้อสินค้าท่านอ่านฉลากก่อนเลือกซื้อบ่อยเพียงใด
☐ ทุกครั้ง ☐ บ่อยครั้ง ☐ บางครั้ง ☐ น้อยครั้ง ☐ ไม่เคย

(10) ท่านมีความรู้เกี่ยวกับฉลากรับรองความเป็นมิตรต่อสิ่งแวดล้อม เช่น ฉลากลดคาร์บอน มากน้อยเพียงใด

☐ มีความรู้มาก ☐ มีความรู้น้อย ☐ ไม่มีความรู้

BIOGRAPHY

NAME	Patsara Tetanananth
DATE OF BIRTH	17 January 1986
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTIONS ATTENDED	Mahidol University, 2003-2006 Bachelor of Arts (English) Mahidol University, 2008-2010 Master of Business Administration (Business Modeling and Analysis)
HOME ADDRESS	7 Chan 43 Rd, Bangklo, Bangkok 10120 Email: bee.ing@gmail.com