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Thai Consumers' Willingness to Pay for Different Front-of-Package Nutrition Labels

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Abstract

This research study focuses on the willingness to pay for food products that have different front-of-package (FOP) nutrition labels, namely include the monochrome Guideline Daily Amounts (GDA) label, the color-coded GDA label, and the traffic light label. While there has been a proposal to adopt the traffic light label, Thailand's Ministry of Public Health currently requires five types of snacks to display the monochrome GDA label. The *n*th price auction was the method employed in this experiment to elicit the willingness to pay from seventy two Thai consumers. The participants had to bid for two types of seaweed and two types of almonds, affixed with three different types of FOP labels or a plain label. The grilled and fried seaweeds contain different amounts of fat, whilst the unsalted and salted almonds contain different levels of sodium. The results show that all of the FOP labels, including the monochrome GDA label, add price premiums to both healthy and unhealthy foods. The traffic light label is effective in influencing consumers' demand, since consumers are willing to pay higher prices for healthier products. In addition, participants were also divided into two groups, after providing one group with additional information about the meanings of the different FOP labels. Under the traffic light label, the group provided with the extra information gave higher valuations on healthier foods.

Keywords: Front-of-package nutrition label, Guideline Daily Amounts label, Traffic light label, Willingness to pay, *n*th price auction

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ความเต็มใจในการจ่ายของผู้บริโภคไทยต่อฉลากโภชนาการหน้าบรรจุภัณฑ์*

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บทคัดย่อ

งานวิจัยนี้ศึกษาความเต็มใจในการจ่ายของผู้บริโภคที่มีต่อฉลากโภชนาการหน้าบรรจุภัณฑ์ประกอบด้วย ฉลากจีดีเอ (หรือฉลากหวาน มัน เค็ม) แบบสีเดียว ฉลากจีดีเอแบบสีสัญญาณไฟจราจร และฉลากโภชนาการแบบสีสัญญาณไฟจราจร แม้ว่าจะมีข้อเสนอให้ใช้ฉลากโภชนาการแบบสีสัญญาณไฟจราจร แต่กระทรวงสาธารณสุขได้ประกาศให้อาหารสำเร็จรูป 5 ชนิดต้องแสดงฉลากจีดีเอแบบสีเดียว การทดลองนี้ใช้วิธีการประมูลสินค้าแบบ *n*th price เพื่อค้นหาความเต็มใจในการจ่ายของผู้เข้าร่วมการวิจัยซึ่งเป็นผู้บริโภคไทยจำนวน 72 คน ผู้เข้าร่วมวิจัยแต่ละคนต้องประมูลสาหร่าย 2 ชนิดและถั่วอัลมอนด์ 2 ชนิด ภายใต้ฉลากโภชนาการหน้าบรรจุภัณฑ์ 3 รูปแบบและฉลากธรรมดาอีก 1 รูปแบบ โดยสาหร่ายทั้ง 2 ชนิดได้แก่สาหร่ายทอดกรอบและสาหร่ายย่าง มีความแตกแต่งกันในด้านปริมาณไขมัน ในขณะที่ถั่วอัลมอนด์ทั้ง 2 ชนิดให้ความแตกต่างในด้านปริมาณโซเดียม ผลการวิจัยพบว่า อาหารที่ดีต่อสุขภาพและอาหารที่ไม่ดีต่อสุขภาพที่มีฉลากโภชนาการหน้าบรรจุภัณฑ์ทุกรูปแบบรวมทั้งฉลากจีดีเอแบบสีเดียวได้รับความเต็มใจในการจ่ายสูงขึ้น แต่ฉลากโภชนาการแบบสีสัญญาณไฟจราจรมีประสิทธิภาพในการเปลี่ยนแปลงอุปสงค์ของผู้บริโภคเนื่องจากฉลากดังกล่าวส่งผลให้ผู้บริโภคยินดีจ่ายราคาสูงขึ้นสำหรับอาหารที่ดีต่อสุขภาพ นอกจากนี้ ในการทดลองได้มีการแบ่งกลุ่มผู้เข้าร่วมวิจัยออกเป็น 2 กลุ่มตามการให้ข้อมูลเพิ่มเติมเกี่ยวกับความหมายของฉลากโภชนาการหน้าบรรจุภัณฑ์ ผลที่ได้คือผู้บริโภคที่ได้รับข้อมูลเพิ่มเติมให้ราคาอาหารที่ดีต่อสุขภาพสูงขึ้นโดยเฉพาะในกรณีของฉลากโภชนาการแบบสีสัญญาณไฟจราจร

คำสำคัญ: ฉลากโภชนาการหน้าบรรจุภัณฑ์, ฉลากจีดีเอแบบสีเดียว, ฉลากโภชนาการแบบสีสัญญาณไฟจราจร, ความเต็มใจในการจ่าย, การประมูลแบบ *n*th price

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โครงการวิจัยนี้ได้รับการสนับสนุนจากสำนักงานคณะกรรมการการอุดมศึกษาและมหาวิทยาลัยมหิดลภายใต้โครงการมหาวิทยาลัยวิจัยแห่งชาติ

1. Background on Nutrition Labels

Several health issues, such as heart disease and diabetes, can be prevented by being more selective in our food consumption. Many consumers realize the importance of maintaining low cholesterol and blood sugar levels, and of reducing their consumption of sodium. However, although consumers may be able to decide whether or not the product is an unhealthy choice, it is not an easy task to come up with accurate levels of the healthiness of varieties of food products. Particularly when it comes to selecting a certain food product, consumers may need relevant information to assist them in the decision making process. For packaged foods, nutrition labels serve this purpose.

Nutrition labels provide consumers with information about the nutritional content of the food. The label may be front-of-package (FOP) or back-of- package (BOP). The BOP label has a drawback in terms of its visibility; for example, details of the products' nutritional value cannot be seen when consumers are browsing through the shelves of several brands of the product. The FOP nutrition label which is displayed alongside the brand name of the food is easily noticeable. It also saves the consumers from wasting time, taking the product from the shelves, turning it around, and reading the label. The FOP label is also beneficial to the producers of healthy food, as it acts as a promotional tool in creating brand awareness and helps to differentiate their products amongst those of their rivals.

With limited space on the front of the package, the FOP nutrition labels have to be adequately simplified for ease of understanding. Some labels signal a simple message that the food is certified to be a healthy choice, according to certain criteria. Several types of FOP nutrition labels have been introduced and adopted in countries around the world; examples of these labels are presented in Figure 1. In Canada and the United States, the Heart and Stroke Foundation introduced the Health Check symbol which certifies foods that meet its criteria on fat, fiber, sodium, sugar, protein, and certain vitamins and minerals (Heart and Stroke Foundation, 2010). The Keyhole symbol originated in Sweden in 1989, and expanded to Denmark and Norway in 2009 (The Norwegian Food Safety Authority and The Norwegian Directorate of Health, 2010). Any packaged food that meets the nutritional criteria in terms of fat, sugar, salt, and fiber, is allowed to display the Keyhole symbol at no extra cost. The Tick symbol adopted in Australia, on the other hand, requires food producers to pay a licensing fee, in order to cover the costs of random audits and other administrative costs (Heart Foundation,

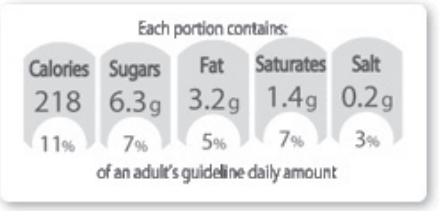
2013). The Choices logo was introduced in the Netherlands in 2006, and covers both the basic foods and non-basic foods, such as snacks (Choices Programme, 2012).

Figure 1: The Health Check, Keyhole, Tick, and Choices Symbols

Sources: The Heart and Stroke Foundation (2010), the Norwegian Food Safety Authority and The Norwegian Directorate of Health (2010), the Heart Foundation (2013), and the Choices Programme (2012) respectively.

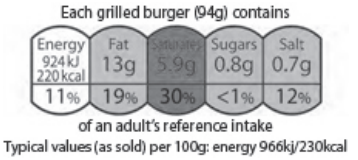
Certain FOP nutrition labels adhere to the Guideline Daily Amounts (GDA) format, which breaks down the nutritional contents of a food product into different sections. These sections are usually displayed in separated cylinder shapes, as shown in Figure 2, and are usually divided into two parts: the top part presents the amount of each nutrient in that packaged food, whilst the bottom part translates those contents into percentages based on the recommended daily consumption. In order to assist consumers in reaching a quick decision, some countries have added colors to the plain GDA label. One example is the Food Standards Agency in Scotland (2013), which codes the GDA label with traffic light colors, as shown in Figure 3. For the same reason, other formats of the traffic light label have also been proposed, see Figure 4. The three traffic-light colors are red, amber, and green which represent high, medium, and low levels of nutrients, respectively.

Figure 2: The Guideline Daily Amounts (GDA) Label



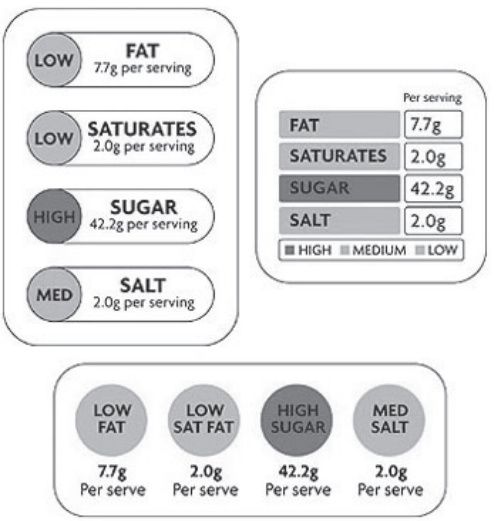
Source: GDA Label (2013)

Figure 3: The FOP nutrition label in Scotland



Source: Food Standards Agency (2013)

Figure 4: Examples of the Traffic Light Label



Source: Food Standards Agency (2007)

At present, countries cannot seem to agree on a standard FOP nutrition label, since each type possesses its own strengths and weaknesses. In the case of Thailand, the Ministry of Public Health (MOPH)'s announcement dated May 7, 2011 requires five types of ready-to-eat food products to display FOP nutrition labels in Guideline Daily Amounts (GDA) format (Food and Drug Administration Thailand, 2011a). The five types of snacks are fried or baked potato chips; fried or baked popcorn; rice crisps or extruded snacks; crackers or biscuits; and wafers with fillings. This has been effective since August 24, 2011, although existing labels could still have been used for an extended period of one year. A maximum fine of Baht 30,000 could be imposed for noncompliance.

The Secretary-General of the Food and Drug Administration Thailand (Thai FDA) has stated that Thai people are facing an increasing problem of overconsumption which has resulted in a rise in the numbers of non-contagious diseases, particularly obesity, diabetes, and high-blood pressure (Food and Drug Administration Thailand, 2011a). These problems escalated to such high levels that the MOPH came up with a policy to convince Thais to consume less sugar, fat, and salt; which resulted in the imposition of FOP nutrition labels. There is also a plan to expand the coverage of FOP labels to other types of food products in the future, which will include all types of snacks and frozen foods (Khaosod, 2013). They will all have to follow the GDA format set by the Thai FDA.

According to the Food and Drug Administration Thailand (2011b), the Thai GDA label consists of four cylinder shapes showing the amount of energy, sugar, fat, and sodium. The background color has to be white, and the edge of the label has to be either black or dark blue. The edge of the label can also be displayed in white, but it has to contrast with the background color. Figure 5 below shows the required Thai GDA label. The wording has to also be written, either in black or dark blue. Since no other colors are allowed, this is referred to as the monochrome GDA label. This GDA label must also cover other existing FOP nutrition labels, for the case of imported products.

Figure 5: Guideline Daily Amounts (GDA) Label

Source: Food and Drug Administration Thailand (2011b)

According to the Food and Drug Administration Thailand (2011b), the statements of “Nutrition information per … [of serving].” and “[The container] should be divided into … servings.” must be posted above the GDA label. When the container is designed for one serving, the second

statement is not required. However, the first statement should be adjusted to "Nutrition information per one container." Below the label, it must state "Calculated as a percentage of the maximum amount of consumption required per day." The headings of the four cylinders are "Energy", "Sugar", "Fat", and "Sodium". Under each of these headings, it states the amount of energy units in kilocalories, the amount of sugar and fat units in grams, and the amount of sodium in milligrams. At the bottom of each cylinder, it has the corresponding percentages, based on the need of 2,000 kilocalories per day, a maximum sugar consumption per day of 65 grams, a maximum fat consumption per day of 65 grams, and a maximum of sodium consumption per day of 2,400 milligrams.

In situation where a snack is packaged in a large container, and is designed for more than one serving, consumers who prefer to consume just one serving may be misled since the GDA label overstates the actual consumption. On the other hand, if a snack is packaged in a small container designed for one serving; with a GDA label showing a very low amount and percentage of the energy component, consumers may be encouraged to consume more than one serving per day, which may not be a healthy decision.

Prior to the announcement of this FOP nutrition label requirement, several parties raised concerns about the effectiveness of the monochrome GDA label, and counter-proposed the adoption of the traffic light labeling instead (Matichon Online, 2011). It is claimed that the monochrome GDA label is academically debatable since consumers still do not yet understand its meaning. The Health Assembly under the National Health Commission Office of Thailand also publicly supports the choice of the traffic light labeling (National Health Commission Office of Thailand, 2012). Sirichakwal et al. (2007) tested 450 students and parents on their understandings of different types of FOP labels. The results confirm that traffic light labeling is the most appropriate choice due to the ease of understanding, even amongst children. Chaladsue Magazine (2012) conducted a survey on 474 Thai consumers during the period of August to October 2011, to ascertain their awareness and knowledge of the nutrition label. The results show that 83.5 percent of the respondents would prefer to have all food products display nutrition labels; whilst only 49.6 percent rate the monochrome GDA label as satisfactory, compared to 84.8% for the traffic light label.

Most studies on the topic of nutrition labels have been conducted in the United States and Europe (Cowburn and Stockley, 2004). Cowburn and Stockley (2004) reviewed both published

and unpublished studies from July 2002 to February 2003; and commented that the actual use of the nutrition label could be overstated, but added that consumers who looked at the label before purchase did gain some understanding from it. Another comprehensive review was carried out by Grunert and Wills (2007) who analyzed 58 research studies during 2003 to 2006. Generally, consumers felt that packaged foods should display the nutritional information, and that the FOP information should be shown in a simple format. However, no conclusion was reached as to the most preferred type of FOP label.

Grunert et al. (2010) studied the European consumers' behavior towards nutrition labels. The study included in-store observations and interviews of 2,019 shoppers from the UK, 1,858 from Sweden, 2,337 from France, 1,963 from Germany, 1,800 from Poland, and 1,804 shoppers from Hungary. After that, questionnaires asking for the respondents' knowledge and understanding of nutrition labels were sent, with the return rates ranging from 36% (France) to 83% (Poland). The results show that whilst 62.6% of shoppers looked at the package, only 16.8% stated that they were interested about the product's nutrition. Shoppers paid most attention to the information about calories, fat, and sugar; and they usually looked for this information at the back of the package, followed by information on the GDA label. Nevertheless, results varied across products and countries. For example, 27% of UK shoppers looked for nutrition labels compared to only 8.8% for French shoppers. In addition, consumers from the UK, Sweden, and Germany seem to have a better understanding about the GDA label than other countries.

To test the effectiveness of the FOP nutrition label, many approaches have been employed. Balcombe et al. (2010), for example, examined how UK consumers' valuations changed with different levels of nutrients. Under, the "choice experiment" methodology, consumers were asked to hypothetically choose a food basket from several options, each with different nutritional contents (or colors on the label). The traffic light label was chosen, even though it was not compulsory in the UK. The results from 477 respondents supported the adoption of the traffic light labeling. UK consumers seemed to have a good understanding about type of label since they were generally against any nutrient that displayed a red color. On the other hand, Möser et al. (2010) asked consumers from Germany and Belgium to compare GDA and traffic light labels. The GDA label has been widely adopted in both countries, whereas the traffic light system was proposed and rejected in Germany. The results from the interviews and questionnaires revealed that traffic light labeling was more preferable for German consumers,

whilst the GDA label was more accepted in Belgium. Signal and Lanumata (2008) studied the effectiveness of the FOP nutrition label by interviewing stakeholders, who were representatives from the food industry, the policy making sector, and non-governmental organizations.

Rather than asking for or observing consumers' behaviors, some researchers attempted to quantify the value of the nutrition label. Loureiro et al. (2006) asked 400 Spanish consumers how much extra they were willing to pay for a box of cookies that displayed a nutrition label, compared to one without. Through this double-bounded probit model, consumers were prepared to pay a price premium of 10.6 percent for the nutrition label. Consumers who were healthy were willing to pay a lower premium of 8.9%, while consumers who were worried about their health were willing to pay a premium of 13 percent.

This research focuses on measuring Thai consumers' demand for food products with different labeling choices. More specifically, Thai consumers' willingness to pay for food items with different types of FOP nutrition labels is quantified, by using the non-survey technique. In addition, the study attempts to test whether knowledge about FOP nutrition labels affects consumers' purchasing decisions. Although the Thai FDA has never publicly rejected the adoption of other types of FOP labels in the future, results from this study would serve as an indicator for the government when launching future food labeling policies.

2. Experimental Methodology

Consumers' willingness to pay can be determined by utilizing several methodologies. Researchers can directly ask random shoppers to hypothetically think about purchasing products that possess different attributes. Surveys can usually be conducted with a large sample size which can be selected to represent the population of a country, see Krystallis and Chryssohoidis (2005) and Loureiro et al. (2006) for examples. One limitation, however, is that those survey responses may not be translated into actual purchasing behavior. Observation of actual shoppers' behaviors is also possible, but shoppers' decisions to purchase only imply that their willingness to pay is higher than the list price (Noussair et al., 2004b). Experimental economists have relied on auctions as an effective tool in quantifying consumers' demand. The second price sealed bid auction (Vickrey, 1961) and the Becker-DeGroot-Marschak (Becker et al., 1964) auction have been widely used for this purpose, since both have theoretically proven that it is in the bidders' best interests to state their true willingness to pay.

This study relies on the *n*th price auction to elicit consumers' willingness to pay, since it is designed to raise the involvements of all bidders (Shogren et al., 2001). Unlike a typical auction, the winners in the *n*th price auction are not limited to only the highest bidder. A number, *n*, is randomly drawn from number 2 to the number of the total participants. Winners are participants who bid higher than the *n*th bidder, and the winners have to actually spend the money to buy the product at the price indicated by the *n*th bidder. Any participant could win the auction, even if they submit very low bids. These so-called "off-margin" bidders will be more engaged during the bidding process. Several researchers have also adopted this type of auction to induce participants to reveal their preferences, see Huffman et al. (2003), VanWechel et al. (2003), Rousu et al. (2004), and Chiaravutthi (2010) for experiments on genetically modified food.

A total of 72 Thai consumers participated in the experiment. Information about the experiment was posted at several public spaces around Mahidol University's Salaya campus. The experiment took place in one of the classrooms at Mahidol University International College. Those interested could contact the experimenters and reserve their seats in the experiment. Participation was voluntary, and each participant received a monetary incentive of 500 Baht. Participants were divided into 6 groups or sessions, each one consisting of 12 participants. In order to investigate how knowledge about the nutrition label influences the willingness to pay, participants in the last 3 sessions (called "informed" consumers) were given additional information about the label; whilst participants in the first 3 sessions (called "uninformed" consumers) did not receive such information. The six sessions were conducted at different dates and times during the months of April and May, 2013.

Conducting experiments is costly, so the size of the sample is constrained by the available budget. Although the sample size in surveys can be large, the sample sizes in experimental auctions have been quite varied. Huffman et al. (2003) conducted experiments which relied on 172 participants who were randomly selected from the cities of Des Moines in Iowa and St. Paul in Minnesota. Noussair et al. (2004a) recruited 97 subjects from the city of Grenoble, and Rousu et al. (2004) recruited 44 representative consumers from around the Des Moines area. VanWechel et al. (2003), on the other hand, relied on 112 students from North Dakota State University.

On the day of the experiment, each participant was asked to read the information sheet and sign the consent form, as required by Mahidol University's Institutional Review Board (IRB). Prior to entering the room, participants needed to randomly draw their identification (ID) from A to L, in order to conceal their identities throughout the whole auction process. Once all participants were seated, the instructions were read out by the experimenter. To ensure that participants understood the auction, two trial rounds took place. Participants bid for one item in the first trial round, and four items simultaneously in the second trial round. After each trial round, the experimenter wrote down all of the bids from highest to lowest on the board, randomly selected the *n*th number, and announced the winners (by IDs). Participants were also allowed to ask questions at the end of each trial round.

In each of the four actual rounds, participants were given four food products namely, deep fried seaweed, grilled seaweed, salted almonds, and unsalted almonds, to examine and submit the bids. Seaweed and almonds were selected due to their popularity amongst Thai consumers, even though they are not currently required by MOPH to display an FOP nutrition label. Two types of seaweed and two types of almonds each had different nutritional values, particularly in terms of fat and sodium levels. Grilled seaweed and unsalted almonds were considered to be a healthier choice for consumers. Table 1 presents details of all of the experimental session rounds. Note that the sequences of the actual rounds were randomly chosen, and differed from session to session.

Table 1: Details of all the Sessions Rounds

Round	Details
Trial round 1	Auction for rice
Trial round 2	Auction for salt, sugar, fish snacks, and sun-dried strawberries
Actual round 1	Auction for seaweed (grilled and fried) and nuts (salted and unsalted) with no FOP nutrition labels
Actual round 2	Auction for seaweed (grilled and fried) and nuts (salted and unsalted) with monochrome GDA labels
Actual round 3	Auction for seaweed (grilled and fried) and nuts (salted and unsalted) with color-coded GDA labels
Actual round 4	Auction for seaweed (grilled and fried) and nuts (salted and unsalted) with traffic light labels

The four food products used in the actual rounds were repackaged to eliminate the influence of product brands on the consumers' decision making process. In addition, the descriptions of the food products were also adjusted, since they could provide a signal to consumers about the nature of the products. Specifically, grilled seaweed and fried seaweed were called "seaweed A" and "seaweed B", respectively; whilst unsalted almonds and salted almonds were renamed "almonds A" and "almonds B", respectively. In the four actual rounds participants were presented with four different labels, which were created by the experimenters. For benchmarking purposes, food products used in the first actual round had plain labels. The second, third, and fourth rounds were conducted using the monochrome GDA label, the color-coded GDA label, and the traffic light label, respectively. For the latter, the green, amber, and red colors were assigned similar to those of the United Kingdom's Food Standards Agency (2007). Figure 6 presents the labels used in the actual rounds.

In each round, the experimenters allowed each participant to examine the four food products for approximately 10 minutes. Each participant then wrote their individual bids for all of the products on the "decision sheet", and then sealed it. The experimenter collected all of the sheets simultaneously. During the next round the same process was repeated until all of the rounds were completed. The whole experiment took approximately 2 hours. Participants were informed that only one actual round would be selected for the actual purchase, along with the *n*th number which was randomly selected by the experimenter and revealed to the participants at the end of the session. The winners were announced and had to use a part of the endowment to purchase the food products. After all of the rounds had ended, participants of each session were asked to fill out a questionnaire asking for their demographics and purchasing behaviors, see Table 2 for selected descriptive statistics.

Figure 6: Actual Labels used during the Experiment

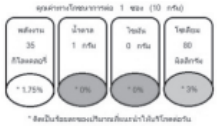
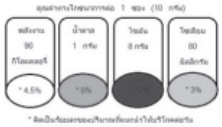
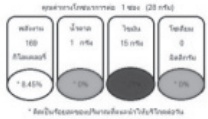
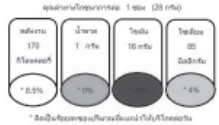
Labels used in the first actual round

สาหร่าย ก	**สาหร่าย ข**	**ถั่ว ก**	**ถั่ว ข**
ส่วนประกอบ: สาหร่าย 70%, ผงปรุงรสดั้งเดิม 30% ปริมาณ 10 กรัม	ส่วนประกอบ: สาหร่าย 85%, น้ำมันพืช 9%, ผงปรุงรสธรรมชาติ 6% ปริมาณ 10 กรัม	ส่วนประกอบ: ถั่วอัลมอนด์ ปริมาณ 28 กรัม	ส่วนประกอบ: ถั่วอัลมอนด์, น้ำตาล, เกลือ ปริมาณ 28 กรัม

Labels used in the second actual round

สาหร่าย ก	**สาหร่าย ข**	**ถั่ว ก**	**ถั่ว ข**
ส่วนประกอบ: สาหร่าย 70%, ผงปรุงรสดั้งเดิม 30% ปริมาณ 10 กรัม	ส่วนประกอบ: สาหร่าย 85%, น้ำมันพืช 9%, ผงปรุงรสธรรมชาติ 6% ปริมาณ 10 กรัม	ส่วนประกอบ: ถั่วอัลมอนด์ ปริมาณ 28 กรัม	ส่วนประกอบ: ถั่วอัลมอนด์, น้ำตาล, เกลือ ปริมาณ 28 กรัม

Labels used in the third actual round

สาหร่าย ก	สาหร่าย ข	ถั่ว ก	ถั่ว ข
ส่วนประกอบ: สาหร่าย 70%, ผงปรุงรสดั้งเดิม 30% ปริมาณ 10 กรัม 	ส่วนประกอบ: สาหร่าย 85%, น้ำมันพืช 9%, ผงปรุงรสธรรมชาติ 6% ปริมาณ 10  กรัม	ส่วนประกอบ: ถั่วอัลมอนด์ ปริมาณ 28  กรัม	ส่วนประกอบ: ถั่วอัลมอนด์, น้ำตาล, เกลือ ปริมาณ 28  กรัม

Labels used in the fourth actual round

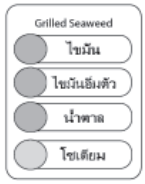
สาหร่าย ก	สาหร่าย ข	ถั่ว ก	ถั่ว ข
ส่วนประกอบ: สาหร่าย 70%, ผงปรุงรสดั้งเดิม 30% ปริมาณ 10 กรัม 	ส่วนประกอบ: สาหร่าย 85%, น้ำมันพืช 9%, ผงปรุงรสธรรมชาติ 6% ปริมาณ 10  กรัม	ส่วนประกอบ: ถั่วอัลมอนด์ ปริมาณ 28  กรัม	ส่วนประกอบ: ถั่วอัลมอนด์, น้ำตาล, เกลือ ปริมาณ 28  กรัม

Table 2: Descriptive statistics of the participants

Variable	Mean	Standard Deviation
Age	33.40	4.91
Gender (Male = 1, Female = 0)	0.38	0.49
Weight (in kilograms)	59.0	11.43
Height (in centimeters)	162.0	6.71
Body mass index	22.14	3.41
Education (Bachelor's degree or higher = 1, Otherwise = 0)	0.93	0.26
Income (Below Baht 5,000 = 1, Baht 5,000-9,000 = 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)	3.40	0.52
Understanding of the GDA label (Scale from 1 to 3; No understanding = 1, Full understanding = 3)	2.13	0.63
Frequency of reading the nutrition label (Scale from 1 to 3; Always = 1, Never = 3)	1.74	0.56
Effect of FOP nutrition label on purchasing decision (Scale from 1 to 3; Significant effect = 1, No effect = 3]	1.64	0.61

Although there were no restrictions on eligibility of the participants, descriptive statistics show that the samples were biased towards those aged over 30, holding at least a bachelor's degree. Since participation in the auctions is voluntary, it has always been a challenge for researchers to evenly select participants from all age groups, or educational levels. Therefore, interpretation of the results should be made with caution since this unique sample could possess certain health-related perceptions which differ from the general Thai population; and more experiments should be conducted to confirm the findings.

3. Results and Analysis

Table 3 shows the averages and standard deviations of Thai consumers' willingness to pay for food products with different nutrition labels. Generally, Thai consumers give price premiums to nutrition labels, as evidenced by the plain labels receiving the lowest bid prices for all four food products. The average bid prices for grilled seaweed, fried seaweed, unsalted almonds, and salted almonds are 9.56 Baht, 10.29 Baht, 17.08 Baht, and 16.67 Baht, respectively. For grilled seaweed and salted almonds, the traffic light labels score the highest bid prices of 11.47 Baht and 18.15 Baht, respectively. On the other hand, the color-coded GDA label receives the highest bid price of 11.40 Baht for fried seaweed. As for the unsalted almonds, the highest bid price is Baht 18.50 for the monochrome GDA label. The last column of Table 3 presents the market prices for all four food products. Focusing on the plain label, the average bids for grilled and fried seaweed are similar to the actual market prices; whilst experimental participants overpriced the almonds.

Table 3: Average bidding prices for different labels (in Baht)

Products	Plain Label [SD]	Monochrome GDA Label [SD]	Color-coded GDA Label [SD]	Traffic Light Label [SD]	Market Price
Grilled Seaweed	9.56 [5.42]	10.18 [5.91]	10.81 [5.11]	11.47 [6.68]	10
Fried Seaweed	10.29 [5.83]	11.18 [6.72]	11.40 [7.02]	10.58 [6.67]	10
Unsalted Almonds	17.08 [10.22]	18.50 [11.60]	18.06 [9.61]	18.35 [10.29]	14
Salted Almonds	16.67 [10.45]	17.83 [10.73]	18.15 [13.40]	18.15 [15.04]	14

Tables 4 and 5 present the results from the t-Tests which compare two different labels for each of the four food items. For grilled seaweed, the color-coded and traffic light labels are statistically different from the normal label; whilst the monochrome GDA and the normal labels are not that different, with a P-value of less than 0.05. As for fried seaweed, consumers perceive all three nutrition labels to be different from the plain label. However, the

monochrome GDA and the traffic light labels are perceived as being similar. For unsalted almonds, the consumers' willingness to pay for the monochrome GDA and the traffic light labels is quite different from that of the plain label. In the case of salted almonds, only the color-coded GDA label is perceived to be different from the plain label. For healthier choices, namely grilled seaweed and unsalted almonds, the traffic light label appears to stand out amongst Thai consumers.

Table 4: t-test Statistics for Comparisons between Two Different Labels of Seaweed

Lebels	Grilled Seaweed		Fried Seaweed	
	t	P-value	t	P-value
Plain and Monochrome GDA	-1.700	0.930	-3.839	0.000
Plain and Color-coded GDA	-2.655	0.010	-3.896	0.000
Plain and Traffic Light	-3.874	0.000	-2.341	0.022
Monochrome GDA and Color-coded GDA	-1.434	0.156	-2.070	0.042
Monochrome GDA and Traffic Light	-2.958	0.004	1.218	0.227
Color-coded GDA and Traffic Light	-1.470	0.146	2.629	0.010

Table 5: t-test Statistics for Comparisons between Two Different Labels of Almonds

Lebels	Unsalted Almonds		Salted Almonds	
	t	P-value	t	P-value
Plain and Monochrome GDA	-2.741	0.008	-1.913	0.060
Plain and Color-coded GDA	-1.575	0.120	-2.219	0.030
Plain and Traffic Light	-2.244	0.028	-1.377	0.173
Monochrome GDA and Color-coded GDA	0.741	0.461	-0.419	0.677
Monochrome GDA and Traffic Light	0.268	0.789	-0.296	0.789
Color-coded GDA and Traffic Light	-0.692	0.491	0.000	1.000

When a country adopts only one labeling policy, it implies that consumers may have to compare between a healthy and an unhealthy food product. Table 6 shows the results from the t-Tests on such a scenario. However, when consumers are trying to decide between grilled and fried seaweed, or between unsalted and salted almonds, different types of nutrition labels do not seem to influence their decisions.

Table 6: t-test Statistics for Comparisons between Two Food Items with Different Labels

Labels	Grilled and Fried Seaweed		Unsalted and Salted Almonds	
	t	P-value	t	P-value
Plain	-1.735	0.087	0.908	0.367
Monochrome GDA	-2.332	0.023	1.209	0.231
Color-coded GDA	-1.083	0.283	-0.112	0.911
Traffic Light	1.411	0.163	0.165	0.869

Experimental participants were equally divided into two groups, “uninformed” and “informed”, depending on which sessions they participated in. Sessions 1 to 3 were for uninformed subjects, whilst those in sessions 4 to 6 were provided with additional information about the meaning of each type of nutrition label employed in the experiment. After the trial rounds, the experimenter distributed information sheets to those participants, and gave them sufficient time to read them. Comparisons of the average bidding prices between these two groups are provided in Tables 7, 8, and 9.

Table 7: Comparisons between Uninformed and Informed Bids for Monochrome GDA labels

	Grilled Seaweed	Fried Seaweed	Unsalted Almonds	Salted Almonds
Without Information	8.97	10.64	16.72	16.42
With Information	11.39	11.72	20.28	19.25
% Increase	26.98%	10.15%	21.29%	17.24%

Table 8: Comparisons between Uninformed and Informed Bids for Color-Coded GDA Labels

	Grilled Seaweed	Fried Seaweed	Unsalted Almonds	Salted Almonds
Without Information	10.50	11.33	17.61	16.69
With Information	11.11	11.47	18.50	19.61
% Increase	5.81%	1.24%	5.05%	17.50%

Table 9: Comparisons between Uninformed and Informed Bids for Traffic Light Labels

	Grilled Seaweed	**Fried Seaweed**	**Unsalted Almonds**	**Salted Almonds**
Without Information	10.14	10.14	17.19	17.72
With Information	12.81	11.03	19.50	18.58
% Increase	26.33%	8.78%	13.44%	4.85%

Having compared the average bids from uninformed and informed consumers, the information provided on the food labels raises the willingness to pay of all food items, regardless of their healthiness. However, healthier products generally hold higher price premiums relative to unhealthy ones. This applies particularly to the monochrome GDA label case, informed consumers react positively to healthy food products as the grilled seaweed' and unsalted almonds premiums are well above 20 percent. A similar result is observed in the case of grilled seaweed affixed with the traffic light label, in which the premium rises to more than 26 percent, compared to the 9 percent premium on the fried seaweed. The only exception is the salted almonds under the color-coded GDA label. Note that the t-Tests are conducted to examine the difference between the average bids of uninformed and informed consumers for each food. At a P-value of 0.10, only the grilled seaweed with the monochrome GDA label and the traffic light label are statistically significant.

The traffic light label combined with information given on the meaning of such labels could influence consumers' decisions, as shown in Table 9. Without the additional information,

consumers do not perceive any difference between grilled and fried seaweed as the average bids of both food items are virtually identical at 10.14 Baht. But when information is provided, the grilled seaweed are highly preferred. As for the almonds, consumers originally prefer the salted ones as their willingness to pay is slightly higher. But when consumers have a better understanding of the labels, the unsalted almonds command a stronger demand.

Several regression models were also run to test the effects of demographics and purchasing behaviors on the price premiums from the monochrome GDA label, the color-coded GDA label, and the traffic light label. The results, not presented here, from such models show that no independent variable is statistically significant in influencing the premiums.

4. Conclusions

Thai consumers have recently become more aware and selective in their food choices. On the regulator's side, the Food and Drug Administration (FDA) in Thailand now requires the monochrome GDA label in order to support Thai consumers' demand for such information. This research explores how Thai consumers react to different types of front-of-package (FOP) nutrition labels, including the monochrome GDA label, the color-coded GDA label, and the traffic light label. The experimental auction was employed as a tool to extract consumers' willingness to pay. Seventy two representative consumers participated in the experiment. The food products used in this research were seaweed and almonds, which are popular snacks amongst Thai consumers.

The results show that Thai consumers have a different willingness to pay for food products that have different nutritional values. Without the FOP label, grilled seaweed receive a lower willingness to pay than fried seaweed; whilst unsalted almonds have a higher willingness to pay when compared to salted almonds. This result could arise from consumers' preferences of one certain taste over another. In terms of actual market prices, both types of seaweed have the same market prices, since both come under the same producer; which is also true in the case of almonds. Another important finding is that any type of FOP nutrition label adds some value to the food products, regardless of their nutritional values.

Although consumers are willing to pay higher prices for products with the monochrome GDA label, this type of label also raises the willingness to pay for unhealthy choices as well. The traffic light label, on the other hand, seems to be an effective tool in influencing consumers'

decision making. Thai consumers prefer fried seaweed over grilled seaweed as presented in Table 10; but with the traffic light label, grilled seaweed now has a higher price premium. Note that fried seaweed has red lights on both the fat and the saturated fat categories, whilst grilled seaweed has green lights on both categories. The traffic light is obvious and easily understood, and it does sway consumers' behavior. As for almonds, consumers give higher prices to unsalted almonds over salted almonds with the plain label and the traffic light label. Note that the amount of sodium in salted almonds used in the experiment has not yet reached the red light level. As such, consumers were making comparisons between the green and the amber lights.

Table 10: Comparisons of Bidding Prices under the plain label and the traffic light label

Product	Plain Label	Traffic Light Label
Grilled Seaweed	9.56 Baht	11.47 Baht
Fried Seaweed	10.29 Baht	10.58 Baht

The experiments were conducted on two groups of participants, the uninformed and informed ones. The informed group was given additional information about the meanings of different FOP labels. Informed consumers react positively to the monochrome GDA label, since they are willing to pay higher prices for all food products. The healthier foods, in particular, receive much higher premiums relative to the less healthy choices. Nevertheless, the traffic light label is highly recommended, as it could still influence consumers' decisions. For uninformed consumers, grilled seaweed and fried seaweed receive the same willingness to pay, whilst salted almonds result in a higher willingness to pay. But when information is provided, grilled seaweed and unsalted almonds now receive higher values.

Although more research on the effectiveness of the nutrition label policy ought to be conducted on a larger scale, in order to cover more representative samples of Thai consumers; the results from this experiment should serve as an early warning signal in terms of the current policy. From a producers' perspective, implementation of the monochrome GDA label required by the Thai FDA may not severely affect their sales, even in the case of unhealthy products. As for the policy makers, their ultimate objective may not be reached through their monochrome GDA label requirement, since consumers' overall reactions towards such labels remain positive. Showing nutritional facts on the front of the package may mislead some consumers into thinking that certain foods are not that unhealthy, and encourage those consumers to actually

purchase them. This is especially true when the nutrition label is not presented in a simple and easily understandable way. The adoption of the traffic light label should be considered along with an aggressive policy on raising the public awareness. It would be socially desirable if the food label policy could help consumers to make a healthier choice.

References

Balcombe, K., Fraser, I., and Falco, S. (2010) "Traffic Lights and Food Choice: A Choice Experiment Examining the Relationship between Nutritional Food Labels and Price", *Food Policy*, 35(3): 211-220.

Becker, G. M., DeGroot, M. H., and Marschak, J. (1964). "Measuring Utility by a Single-Response Sequential Method", *Behavioral Science*, 9(3): 226-232.

Chaladsue Magazine. (2012). "Chaladsue Testing Center for the Category of Food/Health", Issue 134, Nutrition Label and Consumers' Understanding", April 24, 2012. Retrieved from http://www.chaladsue.com/index.php/Food-health/1150-test134.html.

Chiaravutthi, Y. (2010). "Consumer Willingness to Pay and Implications of Differing GM Labeling Policy", mimeo.

Choices Programme. (2012). "A Single Food Choice Logo for the Netherlands". Retrieved from http://www.choicesprogramme.org/news/single-food-choice-logo-netherlands.

Cowburn, G. and Stockley, L. (2005). "Consumer Understanding and Use of Nutrition Labeling: A Systematic Review", *Public Health Nutrition*, 8(1): 21-28.

Food and Drug Administration Thailand, Ministry of Public Health. (2011a). "24th August 2011 FDA announced the enforcement of the GDA nutrition label for good health among Thai people", News for public relations dated June 7, 2011. Retrieved from http://www.fda.moph.go.th/www_fda/data_center/ifm_mod/nw/263076405_GDA.pdf.

Food and Drug Administration Thailand, Ministry of Public Health. (2011b). "Questions-Answer Topic: Issues and Obstacles in Implementation of the GDA Nutrition Label", September, 2011. Retrieved from http://newsser_fda.moph.go.th/food/file/BenefitAdmin/GDA4Sec2011_9.pdf.

Food Standards Agency. (2013). "Front-of-Pack Nutrition Labeling", June 19, 2013. Retrieved from http://www.food.gov.uk/scotland/scotnut/signposting/.

Food Standards Agency. (2007). "Front-of-Pack Traffic Light Signpost Labelling Technical Guidance", Issue No. 2, November. Retrieved from http://www.food.gov.uk/multimedia/pdfs/frontofpackguidance2.pdf.

GDA Label. (2013). "GDA label", Retrieved from http://www.gdalabel.org.uk/ gda/gdalabel.aspx.

Grunert, K. G. and Wills, J. M. (2007). "A Review of European Research on Consumer Response to Nutrition Information on Food Labels", *Journal of Public Health*, 15: 385-399.

Grunert, K. G., Fernández-Celemín, L., Wills, J. M., genannt Bonsmann, S. S., and Nureeva, L. (2010). "Use and Understanding of Nutrition Information on Food Labels in Six European Countries", *Journal of Public Health*, 18: 261-277.

Heart and Stroke Foundation (2010). "Nutrient Criteria". Retrieved from http://www.healthcheck.org/page/program-criteria-3.

Heart Foundation. (2013). "Tick Facts". Retrieved from http://www.heartfoundation.org/au/healthy-eating/heart-foundation-tick/Pages/smart-shopping.aspx.

Huffman, W. E., Shogren, J. F., Rousu, M., and 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.

Khaosod. (2013). "FDA Plans to Add the Types of Food that Require the Nutrition Label, and Advises Consumers to Study the Information First", 23(8289), August 9, 2013.

Krystallis, A. and Chryssohoidis, G. (2005). "Consumers' Willingness to Pay for Organic Food", *British Food Journal*, 107(5): 320-343.

Loureiro, M. L., Gracia, A., and Nayga, R. M. (2006). "Do Consumers Value Nutritional Labels?", *European Review of Agricultural Economics*, 33(2): 249-268.

Matichon Online. (2013). "Submit An Open Letter to the PM to Halt the Announcement of the GDA Label". April 5, 2013. Retrieved from http://www.matichon.co.th/news_detail.php?newsid=1301988469&grpid=no&catid=19.

Möeser, A., Hoefkens, C., Van Camp, J., and Verbeke, W. (2010). "Simplified Nutrient Labeling: Consumers' Perceptions in Germany and Belgium", *Journal of Consumer Protection and Food Safety*, 5, 169-180.

National Health Commission Office of Thailand. (2012). "The Health Assembly this Year Every Party Agrees to Discuss about the Progress on Solving the Problem of Obesity among Children". January 14, 2012. Retrieved from http://www.nationalhealth.or.th/index.php?view=article&catid=3%3Anewsflash&id=416:2012-01-15-18-46-41&catid=3:newsflash&Itemid=72.

Norwegian Food Safety Authority and Norwegian Directorate of Health. (2010). "The Keyhole", April 28, 2010. Retrieved from http://www.nokkelhullsmerket.no/frontpage_en/article427.ece/BINARY/Fact%20sheet%20about%20the%20Keyhole.

Noussair, C., Robin, S., and Ruffieux, B. (2004a). "Do Consumers really Refuse to Buy Genetically Modified Food?", *The Economic Journal*, 114: 102-120.

Noussair, C., Robin, S., and Ruffieux, B. (2004b). "Revealing Consumers' Willingness-to-Pay: A Comparison of the BDM Mechanism and the Vickery Auction", *Journal of Economic Psychology*, 25: 725-741.

Rousu, M., Huffman, W. E., Shogren, J. F., and Tegene, A. (2004). "Are United States Consumers Tolerant of Genetically Modified Foods?", *Review of Agricultural Economics*, 26(1): 19-31.

Shogren, J. F., Margolis, M., Koo, C., and List, J. A. (2001). "A Random *n*th Price Auction", *Journal of Economic Behavior and Organization*, 46: 409-421.

Signal, L. and Lanumata, T. (2008). "The Feasibility of Front-of-Pack Nutrition Labelling and Research to Measure its Effectiveness in New Zealand: The Views of Key Stakeholders", Health Promotion and Policy Research Unit, University of Otago.

Sirichakwal, P., Kamchansuppasin, A., and Sangasatechai P. (2007). "Project to Test the Consumers' Acceptance on the Signs of Nutritional Levels (fat, sugar, and sodium)", Reported submitted to the National Health Foundation, Thailand Research Fund.

VanWechel, T., Wachenheim, C. J., Schuck, E., and Lambert D. K. (2003). "Consumer Valuation of Genetically Modified Foods and the Effect of Information Bias", Agribusiness and Applied Economics Report No. 513, North Dakota State University.

Vickrey, W. (1961). "Counterspeculation, Auctions, and Competitive Sealed Tenders", *Journal of Finance,* 16(1): 8-37.

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ปีที่ 8 ฉบับที่ 2 (กรกฎาคม 2557)

การวิเคราะห์ความยั่งยืนทางการคลังของไทย ตามแนวคิดพื้นที่การคลัง

นรพัชร์ อัศววัลลภ*

บทคัดย่อ

การวิเคราะห์ความยั่งยืนทางการคลังโดยทั่วไปสามารถทำได้หลายวิธี บทความนี้เลือกนำเสนอการวิเคราะห์ความยั่งยืนทางการคลังตามแนวคิดพื้นที่การคลัง (Fiscal Space) ซึ่งเป็นวิธีที่ค่อนข้างใหม่และเริ่มเป็นที่แพร่หลายในต่างประเทศ แนวคิดพื้นที่การคลังอาศัยวิธีการประมาณค่าพฤติกรรมการตอบสนองของดุลการคลังในอดีตที่มีต่อระดับสัดส่วนหนี้สาธารณะต่อ GDP ซึ่งสามารถนำไปคำนวณหาระดับสัดส่วนหนี้สาธารณะต่อ GDP ดุลยภาพ และระดับเพดานสัดส่วนหนี้สาธารณะต่อ GDP ได้ โดยในกรณีของประเทศไทย พบว่า ระดับสัดส่วนหนี้สาธารณะต่อ GDP ดุลยภาพอยู่ที่ระดับร้อยละ 45.3 ซึ่งใกล้เคียงกับระดับหนี้สาธารณะของไทยในปัจจุบันแสดงให้เห็นถึงความมีเสถียรภาพของฐานะการคลัง ในขณะที่พบว่าเพดานหนี้สาธารณะของไทยอยู่ระดับร้อยละ 60 สอดคล้องกับกรอบความยั่งยืนทางการคลังของกระทรวงการคลังในปัจจุบันและแสดงให้เห็นว่าฐานะการคลังของไทยในปัจจุบันยังคงมีความยั่งยืนทางการคลัง

คำสำคัญ: ความยั่งยืนทางการคลัง, พื้นที่การคลัง, ประเทศไทย

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งานวิจัยนี้อยู่ภายใต้โครงการวิจัยของข้าราชการผู้มีผลสัมฤทธิ์สูงของสำนักงานเศรษฐกิจการคลัง กระทรวงการคลัง ประจำปีงบประมาณ 2556