Master's Thesis of Science in Agriculture

Valuing Attributes of Fluid Milk in Laos: A Comparison of Real and Hypothetical Products

라오스 소비자 특성에 따른 우유의 속성별 가치 평가:

가상 제품과의 비교

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Abstract

Lao' dairy market is small and under developed due to low level of per capital income with around 7 million population. Most milk products are imported from Thailand and Vietnam. The Lao government had tried to develop its national brand, for example, Nabong milk, however it failed in 2008 because of lack of competitiveness compared to other importing milk products. The Lao government still has a plan to develop its dairy industry by making its own national brand. The Lao government's development plan continuously hope to develop the dairy industry. With that in mind, this study this study estimates random utility function of fluid milk using 1,165 survey data in Laos. It finds out both products' attributes and individual characteristics affecting consumer's preference on the milk and compares four real milk products and hypothetical one with the brand of Laos-Korea that has never been traded assuming a potential influence of Korea caused by the bilateral cooperation between two countries. Lao national brand, Nabong is also included for understanding people's awareness although it is not available at current market. Results show that the calories has a positive relationship with consumer's preference while the price and fat have negative one. The decision for choosing each brand is significantly affected by individual characteristics such as gender, age, whether or not to live with kids, the level of education, income, the frequency of purchasing a milk per week, and the region where they are living. The preference for five brands appears in the order of the Foremost, Nabong, Thai-Danish, Meiji, and Lao-Korea, and probabilities of purchasing each brand at the mean level are 30.9%, 17.48%, 21.48%, 15.0% and 10.39%, respectively. In addition, policy of promoting livestock and milk industry in Laos would be more effective if it focuses more on having a good national brand, female consumers, family with kids, high quality of milk products, the young generation, and Vientiane capital areas.

Key words: Laos; Consumer Preference; Fluid Milk; the Hypothetical Product; Conditional Logit

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List of Abbreviation

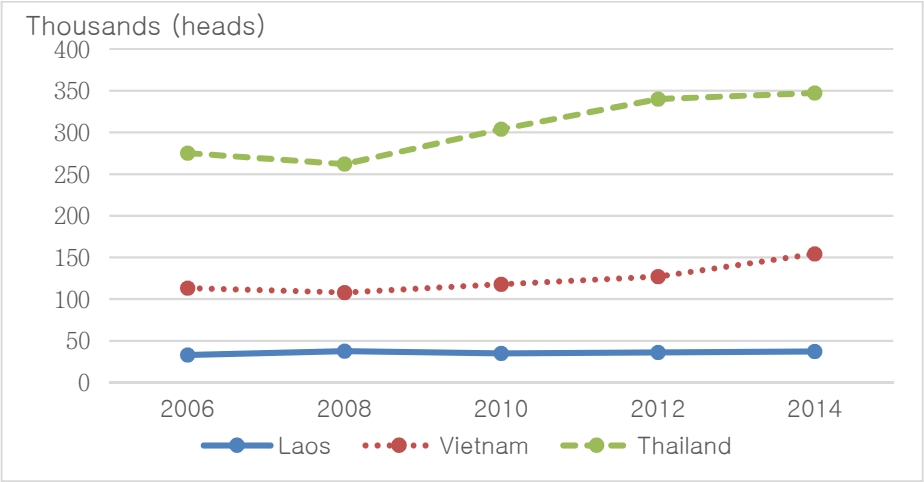
ASEAN	Association of South East Asian Nations
CPS	Country Partnership Strategy
DAC	Development Assistance Committee
FAO	Food Agriculture Organization
ICAR	International Committee for Animal Recording
IDF	International Dairy Federation
KOTRA	Korea Trade-Investment Promotion Agency
MDG	Millennium Development Goal
MOAF	Ministry of Agriculture and Forestry
MOH	Ministry of Health
MPI	Ministry of Planning and Investment
NGO	Non-Governmental Organization
NSEDP	National Socio-Economic Development Plan
NUOL	National University of Laos
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
R&D	Research and Development
SDGs	Sustainable Development Goals
UN	United Nations
WFP	World Food Program
WHO	World Health Organization

1. Introduction

1.1. Current Status of Milk Market in Laos

Laos dairy industry does not develop much since causes of investment on dairy industry lack due to small size of economy and population, since it is a land-locked country, and since there exists limit in supplying stock feed and circulation due to 80% of its land being mountain(Chazee, 1999). When comparing Laos' dairy industry with other nations around Laos, anyone can easily catch handicaps in environment that Laos has. It is pivotal for Laos to be compared with nearby nations since Laos is largely affected by nearby nations like Thailand or Vietnam. The reason for shutdown of Laos' government-led dairy manufacturing companies in 2008 is because they lost in competition with companies of Thailand. Number of dairy cattle in Laos stays stable at around 40 thousand from 2006 to 2014, as stated in Figure1. In contrast, number of dairy cattle in Vietnam and Thailand increased by 26.3% and 36.2% in 2014 compared to 2006, and each nation possesses 150 thousand and 350 thousand dairy cattle in 2014. As a major exporting nation of agricultural products to Laos, development of dairy industry in these two nations means a barrier to grow for Laos dairy industry.

Figure 1. The Number of Dairy Cattle in 3 Countries from 2006 to 2014



Source: FAO

Looking at Table 1. that compares Laos' dairy cattle's daily production of milk with that of nearby countries, Laos shows stable figure of 0.5L per day from 2006 to 2014. This is a very low figure compared to that of Thailand and Vietnam. Thailand has been sustaining 8L per day for 8 years, and Vietnam has shown increase from 5.2L in 2006 to 9.7L in 2014, which proves increase in production efficiency. According to International Committee for Animal Recording(ICAR)'s data, South Korea's figure reaches up to 24L per day, which proves a low efficiency of milk production in Laos. Milking is decided by many factors such as species, climate, breeding management and etc. It won't be right to directly compare South Korea and Southeast Asian nation's milk production, but

comparison was made based on South Korean dairy industry's experience of enhancing production in a short period of time.

Table 1. Daily Milk Production in 3 Countries

(Unit: Liter)

	2006	2008	2010	2012	2014
Laos	0.55	0.55	0.55	0.55	0.56
Thailand	8	8.22	8.21	8.24	8.42
Vietnam	5.22	6.65	7.12	8.23	9.76

Source: FAO

Laos does have diverse environmental limits unsuitable for dairy industry, but does have some positive geographical and climatic aspects compared to Thailand and Vietnam. The government of Laos also recognized the need for enhancement in dairy and stock breeding environment, and is pursuing technology improvement projects in cooperation with international organizations and foreign aid agencies.

As seen in Table 2, quantity of Laos' milk import is continuously increasing and most of them are imported from Thailand. The government of Thailand pursued development of milk industry through diverse aid policies from 1994, and hoped to improve effectiveness by considering both production and consumption aspects. Thailand's total production of milk in 2007 marked 770 thousand tons, and most of them were sold in

the form of drink. Also, they sold rehydrate milk from milk powders of foreign nations to nearby countries such as Cambodia, Indonesia, Philippine, Myanmar, Laos, etc. Most of milk sold in Laos is from Thailand, marking 10,830,000 dollars in 2013 and usually more than 10 million dollars a year. Not only that, most of the dairy products are also imported from Thailand, and South Korea once sold rehydrate milk worth 2000 dollars in 2016. Size of import from countries other than Thailand is very small. This is because Laos consumers prefer Thai food, and because the market doesn't seem so attractive considering unstable circulation infrastructure, high cost in entering the market, and small market size.

Table 2. Import of Skimmed Milk in Laos (2013-2015)

(Unit: Thousand dollars)

Countries	2013	2014	2015
Thailand	10,658	12,535	10,016
Vietnam	78	34	796
America	0	273	0
France	13	9	23
Denmark	0	0	2
Republic of Korea	0	0	1
Germany	0	30	0
Total Cost	**10,749**	**12,881**	**10,838**

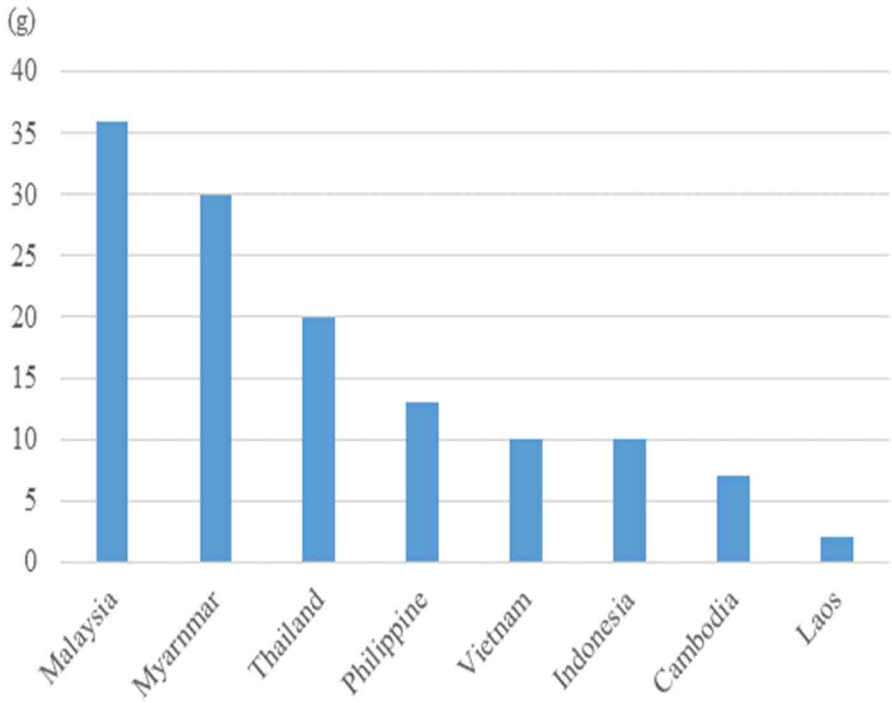
Source: ITC (International Trade Centre)

It was conducted investigation of milk market in Vientiane region during the second half of 2015 for the purpose of analyzing the possibility of South Korean product's market advance into Laos market by researcher. Most of milk sold in Vientiane, as stated in Table 2, are from Thailand. The most familiar brand was 'Foremost', a Netherlands company producing its products in Thailand. Another famous brand, Thai-Danish, is a milk produced by Thailand in cooperation with Denmark, and there also exists a relatively expensive high-quality milk named Meiji. Meiji is a Japanese company using milk produced in Thailand. Consumers considered price, brand, calorie, and percentage of fat as the most important factors, and also considered other factors like quantity, design and manufacture process. Like this, Thailand succeeded in the market not by showing of its native brand but by advertising in the name of foreign nation's brand. Like this, if Laos also advertises in the name of cooperative brand with foreign companies, they would be able to overcome the short comes that Laos' dairy products have.

Total consumption of milk around world is estimated up to 78 million tons a year in 2013, and the dairy market is Asia is showing biggest growth. Also, 55% of worldwide milk import is done in Asian markets, and consumption of milk is expected to greatly increase per economic developments of several developing nations such as china. Rank of milk

consumption in Southeast Asia, as stated in Figure 2, is as followed: Indonesia, Thailand, Myanmar, Philippine, Malaysia, Vietnam, Cambodia, Laos. Compared to amount of milk consumption per person in Thailand(20g), that of Laos only marks 10% of Thailand(2g). However, Laos' economy is showing rapid growth, and considering consumption patterns of nearby countries, especially Thailand and Vietnam, rapid growth of milk consumption in Laos can be expected.

Figure 2. Daily Milk Consumption of ASEAN Countries



Source: FAO, Vinod Ahuja and Steve Staal(2013)

A case allows this kind of prediction. Laos shares TV programs with Thailand based on their similar language, and thanks to this, people of

Laos freely access to news and advertisements of Thailand. Therefore, Laos citizens can easily come across advertisements encouraging consumption of milk, and it is predicted that recognition regarding nutritional importance of milk will continue to improve as well. (Phoutthakeo at al, 2013).

1.2. Background and Purpose

In 2015, UN adopted SDGs(Sustainable Development Goals) and presented the solution to poverty and famine, including enhancement in child nourishment, as the top propriety. In the case of Laos, one of Asia's poorest nation, 55% of children under 5 years old, approximately 400 thousand children, are under hyposomia and malnutrition, thereby being more vulnerable to additional diseases. Many of NGOs and international organizations are focusing on nutrition enhancement programs targeting children under 5 years old in Laos, but enhancement programs for children over 5 years old are relatively deficient. Even if there exists an enhancement program for children over five, it would be inefficient since it isn't easy to nourish and take care of children spread throughout each family. However, even though children over five are less vulnerable to dangers of malnutrition than those under five, they are more efficient in planning and carrying out the project since they usually belong to

organizations like kindergarten or elementary school. According past MDGs results, the World Health Organization (WHO) and the Ministry of Health (MOH) of Laos in 2012, 27% of children under 5 years old shows low level of body weight while 44% shows malnutrition due to undernourishment. Those figures are lower than the goals of having less than 22% for low level of body weight and less than 34% for malnutrition, which are supposed to meet in 2015 as parts of the Millennium Development Goal (MDG). In particular, the Laos government continuously attempts to develop the livestock and dairy farming industry for improving people's nutrition and overcoming technological and financial limitations. The 6thNSEDP (2006-2010) includes the development of the milk industry but milk producing companies operated between 2006 and 2008 were out of business due to the high level of milk loss, lack of managerial capacity and distribution technology and global financial crisis in 2008 (Chadwick et al., 2008). The 8th NSEDP (2016-2020) also emphasizes on providing milk and food supplements to children at schools as well as promoting livestock industry (MPI,2015).

Previously, providing milk to elementary students once a day was quite common to other developing countries initiated by the World Food Program (WFP) and the Food and Agriculture Organization (FAO) which are continuously carrying out several milk-supplying programs for the

improvement of children's nutrition in the world together with the International Dairy Federation (IDF). Recently, school meals program supported by the WFP is implemented with over 1,500 primary schools in Laos to improve the nutritional status of school children and their families, which is also encouraging school enrollment and attendance. For the long-term perspective, it is more important for Laos government to have this type of nutrition programs by themselves with an appropriate market system.

Meanwhile, not only is Laos' industrial base for dairy industry weak, but they also have a failure experience regarding development of dairy industry through assistance of other developed nations. However, the Laos government still presents milk as a food to enhance their people's health through Ministry of Agriculture Vision 2030 and total consumption of milk is also rapidly increasing, so building successful basis of the production of milk is highly expected in the long-term. Concerning preceding researches, there are many researches focusing on the status of Laos' malnutrition status accumulated by NGOs and scholars, but there aren't many researches regarding enhancement of nutrition by providing food such as milk. Investigation on dairy product market and research development status still lacks, and there aren't any solutions for establishing successful industrial basis. Therefore, this research contains

the necessity of enhancement in Laos children's nutrition, status of dairy farming and Laos' dairy market, and hopes to improve the effectiveness of South Korea's agricultural development assistance against Laos.

South Korea selected Laos as a strategic cooperation nation in the field of development assistance, and assisted 75 million dollars of grant and another 65 million dollars of credit assistance for 5 years from 2010 to 2014. When considering present aid status of diverse cooperation fields on Laos, 25.2% accounts for supply of water and hygiene, 18.7% accounts for health, 17.6% accounts for transportation and storage, 9.9% for education and 7.6% for agriculture and fisheries, and total amount of ODA on agriculture and fisheries is estimated to be 16 million dollars. (statistics from OECD DAC). South Korean government plans to pursue a 2nd Laos CPS, selected four main areas that were developed between 2013 and 2015(Water and health, energy, education, local development) and continue aiding Laos. Particularly, the area of local development will focus on poverty reduction and increase in income in farming areas, and plan to pursue overall developmental aid in farming areas. The biggest problem that Laos now faces in enhancing children's nutritional status is that they do not have high-quality food to do so. Enhancement in nutrition through intake of meat and dairy products is required, but supply of these food is unstable due to lack of industrial basis. According to diverse researches

of South Korea's agricultural ODA, diverse macroscopic policies and approaches for the development of farming areas have been discussed, but microscopic approaches to enhance value chains are not enough (Kim and Heo, 2016).

This study estimates the value of attributes of fluid milk and consumers' characteristics by 4 real products (Foremost, Nabong, Thai-Danish, and Meiji) to a hypothetical one (Laos-Korea) assuming that the willingness to pay for the hypothetical products would reveal a latent brand power of Korea in Laos. Lao consumers' recognition on their previous national milk brand, Nabong, that is not available in the current market is also explained. It is interesting to examine empirically how much development aid can create a potential influence in recipient countries by studying consumers' preferences in an example of milk products in Laos.

2. Literature Review and Methodology

2.1 literature Review

SDGs, compared to MDGs, established a sustainable system of production, distribution and consumption, thereby providing way towards better supply of nutrition (Griggs et al. 2013). Child malnutrition is largely seen in poor and vulnerable class, and many children of developing countries are suffering from malnutrition. Looking more deeply into developing nations, those living in suburban areas are suffering from more severe qualitative and quantitative malnutrition compared to children living in urban areas. (Miyoshi et al. 2005; Black et al. 2008).

In such a situation, the distribution of milk powder can be considered as a priority project. Many cases of improving children's nutrition by giving them reconstituted milk were already suggested in various developing countries (Anderson 2001; Black et al. 2002; Torrejón et al. 2004; Du et al. 2002). The reconstituted milk combined by dry whole milk solids with the appropriate amount of water has also advantaged such as a longer shelf life, various milk products with additional flavors, and easy management system for businessmen with a similar nutrition while its taste is different from the fresh milk that has a superior flavor.

For the market research, one early study indicates that national brand is reflected and changed over time in product image (Nagasima, 1977). National image also depends on the culture which incorporates economic development, education, economic size, population, and political situation (Forgas and O'Driscoll, 1984). As aid projects from international donors including international organizations, so called, official development assistance (ODA) have been actively undertaken in Laos, it is expected that such donors' activity can play an important role in creating donors' brand image to consumers in Laos. Therefore, ODA can be linked with private sectors that want to promote their market capacity to other countries. It can be also helpful to international donors as well as recipient countries who try to have an additional partnership for enhancing public resources. An empirical study (Kim and Lee, 2010) has also proven to have positive effects on the formation of Korean national brand from ODA especially in the intention to visit Korea and purchase Korean products from recipient countries.

Studies on dairy markets usually evaluate consumer's preference based on attributes of milk or related values, and suggest policy implications by examining responses from survey questionnaires. In Turkey, for instance, where most households consume raw milk, researchers find that the income and education have a positive relationship with the consumption

of pasteurized milk that is promoted by the government while the number of households and age of household head have a negative one (Tiryaki and Akbay, 2010). In the region of Qingdao in China, consumers prefer pasteurized milk to low-fat milk and low-fat milk to fresh milk with 4 significant attributes such as fat, processing methods, tastes and prices for purchasing milk products, and female consumers like fresh milk compared to males, and the old is more sensitive to the fat contents than the young (Bai et al., 2007). Lao consumers do not consider that they distinguish the sterilized milk from the pasteurized milk since most milk products are sterilized milks with a long shelf life in Laos due to the lack of the cold chain management.

According to the 6th National Socio-Economic Development Plan(NSEDP), the Laos government originally had plans to lead the development of dairy industry, but due to crisis in the industry, this was exempted in the 7th NSEDP. However, according to "Vision 2030" by Ministry of Agriculture, the importance of milk is still stressed and enhancement of nutritional status through milk is still pursued. It seems that exemption from the 7th NSEDP was due to an absence of native dairy company. 7 dairy companies in total were established in Vientiane from 2996, but they all closed due to problems in operation.

In 1984, Laos government imported 120 Holstein cattles and raised them in Nabong area, 30 km north from Vientiane capital so that the Nabong became a national milk brand. However, it was closed down in 2008 due to lack of business capacity. As a result, most dairy products in Laos are imported from neighboring countries, especially Thailand because it has a similar language with TV programs and advertisement (Phoutthakeo et al., 2014). There were companies producing fresh milk, but it had diverse problems such as small market size, low competitiveness, lack of management ability, difficulty in operation and lack of circulation infrastructure, and it eventually closed in 2008 due to global financial crisis. (MOAF, 2006). However, some farms around Vientiane are starting to try dairy farming, and a large dairy complex is being built in the northern Xieng Khouang region aided by the Japanese government. Therefore, higher interest is expected regarding Laos government's diary industry.

Laos is a nation having diverse barriers to cross for the development of livestock industry, including dairy farming. Considering Laos' current dairy market, it is hard for new native dairy companies to step inside the market. Since the market is small and customs entry is relatively simple, imported milk comes into the market with no difficulties and triggers price competition, rather than the quality of dairy products. Also, due to lack of

circulation infrastructure, it is hard to circulate delicious but short-lasting dairy products. However, since basis for circulation such as roads or refrigeration facility is continuously developing, limitation in the industry's development caused by lack of infrastructure will gradually decrease. Other than this, there still are other diverse barriers such as lack of technology, unstable supply of stock feed and aid policy for small businesses. However, things have gotten better compared to 2008 when 'Nabong Milk' closed its door, so higher possibility of success is expected once a more efficient entry strategy is settled through deeper analysis of Laos' dairy market.

2.2 Random Utility Model

Studying consumer's preference can be here considered as unordered-choice models that can be derived from a random utility model (U_{ij}) (Greene, 2003: 719). It can be expressed as follows

$$U_{ij} = \boldsymbol{z}'_{ij}\boldsymbol{\beta} + \varepsilon_{ij} \quad (1)$$

where, $\boldsymbol{z}'_{ij}\boldsymbol{\beta}$ represent the systematic utility value of consumer I based on the attributes for each alternative j, $\boldsymbol{z}_{ij}$ is the vector of explanatory variables that affect the systematic utility, $\boldsymbol{\beta}$ is the vector of parameters to estimate, and ε_{ij} is the error term. If consumer i chooses not the k

alternative but the j alternative, then the probability of having maximum utility U_{ij} among the J alternatives is

$$\text{Prob}\,(U_{ij} \geq U_{ik}) \text{ for all other } k \neq j. \quad (2)$$

If the J disturbances are independent and identically distributed with type I extreme value (Gumbel)distribution such as

$$F(e_{ij}) = \exp(-exp^{-\varepsilon_{ij}}), \quad (3)$$

then the probability for consumer i choosing alternative j leads to the conditional logit model as below (McFadden, 1973)

$$\text{Prob}(Y_i = j) = P_{ij} = \frac{\exp(z'_{ij}\beta)}{\sum_{j=1}^{J}\exp(z'_{ij}\beta)}. \quad (4)$$

If the random utility function influenced by both the attributes of the choices x_{ij} and the consumer characteristics w_i is incorporated in z_{ij} from the equation (4) such that $z_{ij} = [x_{ij}, w_i]$, then it can be written as

$$\text{Prob}(Y_i = j) = \frac{\exp(x'_{ij}\beta + w_i'\beta)}{\sum_{j=1}^{J}\exp(x'_{ij}\beta + w_i'\beta)} = \frac{\exp(x'_{ij}\beta)\exp(w_i'\beta)}{\left[\sum_{j=1}^{J}\exp(x'_{ij}\beta)\right]\exp(w_i'\beta)} = \frac{\exp(x'_{ij}\beta)}{\left[\sum_{j=1}^{J}\exp(x'_{ij}\beta)\right]}. \quad (5)$$

As a results, the probability does not have terms $(w_i'\beta)$ that are related to the individual, indicating that probability of choosing alternative j option for i individual is not affected by individual's characteristics. When the consumer's characteristics (w_i) are not included in equation (5), it is generally called as the conditional logit model.

For each individual i, let $d_{ij} = 1$ if $Y_i = j$, and 0 otherwise. Then the logarithmic likelihood function (ln L) can be expressed as.

$$\ln L = \sum_{i=1}^{n} \sum_{j=0}^{J} d_{ij} \ln \text{Prob}(Y_i = j). \quad (6)$$

If the attributional variable ($\boldsymbol{x}_k$) for each alternative (k) is a continuous variable in the conditional logit model, the marginal effect (Greene, 2003: 723) can be expressed below

$$\frac{\partial \text{Prob}(Y_i = j)}{\partial x_k} = \left[\text{Prob}_j(\mathbf{1}(j = k) - \text{Prob}_k)\right]\boldsymbol{\beta}, \quad k = 1, \ldots, J. \quad (7)$$

3. Survey and Data Description

3.1 Survey Design

Whole procedure of survey is as followed in figure 3. Detail information of preference survey, 1st and 2nd pretest is attached on Appendix. 11. Result for milk preference test shows brand, price, calorie and fat were selected as main characteristics considered when Laos consumers buy milk. the result of 1st Pre-test answered by 66 people shows factors affecting brand relatively has significant meanings. 1st pre-test result was aroused the necessity of the 2nd pre-test, adjusted questionnaires needed to unify variables except the main factors which are brand, price, fat and calories. In addition, the results of the survey showed that changed the design to

better understand of the questionnaire for the respondents were able to understand the questionnaire.

Afterwards, the result of the Improved questionnaire's design and highlighted the key factors of the product is estimation figure for all variables have significant meanings under 1%. In other words, consumers lessen efficiency on milk when price goes up, while the opposite works for fat and calorie. When looking at each brands, Lao-Nabong, Lao-Korea, Thai-Danish, Foremost and Meiji in order were preferred by consumers. If fresh milk is produced in Laos, it would be preferred as much as milk imported from Thailand. Also, when producing milk in Laos in cooperation with Korea's techniques, it would be competitive in the market even when comparing with milk imported from Thailand. Yet, considering that answerers are consisted of students from Laos National Agricultural University, it is hard to identify overall preference of Laos

Figure3. Whole Procedure of Survey

Designing the experiment and questionnaire is the most basic and important stage in using conjoint method (Anderson and Wiley, 1992). As

shown in Table 3, five levels for each attribute are considered based on the results of pretest. For the choice experiment, total combinations of 3 attributes with 5 levels are 125 profiles () in the full factorial design assuming the brand being fixed in the questionnaire. Price ranges from 2,000 kip to 6,000 kip per one small pack, calorie from 110 kcal to 190 kcal per a pack, and fat 0 g to 15 g per a pack. One small pack of sterilized milk contains 200 ml in general in Laos.

Table 3. Attributes and Levels in Choice Experimental Design

Attributes	Levels
Price (kip/a pack)	2,000, 3,000, 4,000, 5,000, 6,000
Calorie (kcal/a pack)	110, 130, 150, 170, 190
fat (g/a pack)	0, 4, 8, 12, 15

Blocking is one way of reducing total questions for each respondent without losing essential information from respondents since blocks are balanced partitions of choice questions usually with equal size focused on main effects, and it can eventually increase response efficiency (Johnson et al., 2013). Block randomization as one of a fractional factorial design can reduce sampling variability and ensure subgroups being available for separate analysis (Gerber and Green, 2012). For this survey in Laos, 10

questions are asked with the block randomization in order for respondents to keep their concentration on the survey.

The command of “Proc factex” from SAS enables us to have the block random assignment shown in Table 4. There are 5 blocks as the minimum since it has total 125 designs. Only 2 blocks are used for this research among 5 blocks in practice. One possible limitation using 2 blocks would be over or under estimation of willingness to pay for each brand since it does not consider perfectly balanced design for each brand. However, it can still provide useful information in terms of consumer’s preference for each brand since it follows the block random assignment. For instance, average price is 4,000 kip, average fat is 7.8 g and average calorie is 150 kcal for both block A and B, which indicates that overall dispersion is quite balanced within the block at the mean level. When it comes to 10 questions for each person, average price for Foremost, Nabong, Thai-Danish, Lao-Korea and Meiji are 3,700, 4,200, 4,100, 4,100, 3,900 kip, respectively, which is slightly different from the average but still within a certain range.

Table 4. The Composition of Questionnaire

Attributes	Questions									
	1	2	3	4	5	6	7	8	9	10
	Block A					Block B				
Foremost										
Price	2,000	4,000	4,000	4,000	5,000	2,000	2,000	5,000	6,000	3,000
Fat	0	8	15	4	8	4	8	4	8	4
Calorie	110	150	190	110	170	130	190	170	170	110
Nabong										
Price	4,000	6,000	6,000	3,000	2,000	3,000	5,000	4,000	5,000	4,000
Fat	0	0	8	0	4	15	15	8	0	12
Calorie	170	150	190	190	150	190	130	130	190	190
Thai-Danish										
Price	3,000	5,000	3,000	4,000	6,000	6,000	2,000	4,000	5,000	3,000
Fat	8	0	4	12	4	4	12	0	12	8
Calorie	110	130	170	130	130	190	170	110	150	150
Lao-Korea										
Price	3,000	5,000	3,000	5,000	6,000	6,000	2,000	4,000	2,000	5,000
Fat	12	15	15	4	12	0	0	15	15	8
Calorie	150	150	130	190	170	130	150	170	110	110
Meiji										
Price	5,000	2,000	2,000	6,000	2,000	3,000	6,000	3,000	4,000	6,000
Fat	12	15	12	15	8	0	15	12	4	12
Calorie	110	170	190	110	130	170	150	130	150	110

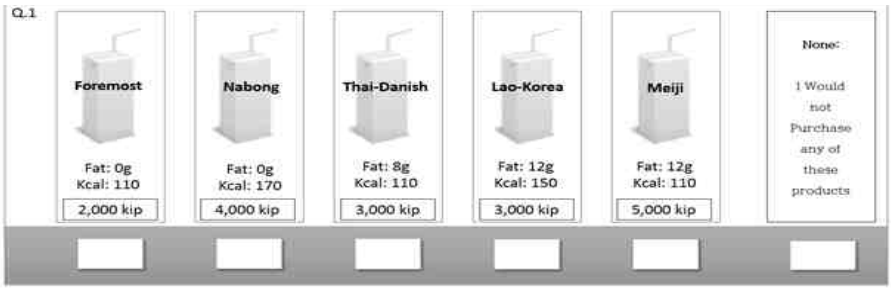
5 blocks were designed and only 2 blocks are used for this survey.

The survey was carried out between July 8th and August 18th, 2015 by targeting total 1,200 people with 400 people in each of the 3 biggies cities, Vientiane, Pakse and Luang Prabang in Laos. With the help of the college

of agriculture at National University of Laos (NUOL), a license for this research was received and the survey was carried out with the students from the college of agriculture.

Each question has 6 choices with 4 real brands, one hypothetical brand, and the case of not choosing any brand shown in figure 4. The order of each brand is identical across questions for all respondents and the level of attributes for each brand is changed based on the random assignment from table 15. Since the milk size is the same for each brand, a typical sterilized milk with size of 200 ml is assumed. Price information is right above the check box considering that consumers' final decision would be much more affected by price information than the others such as fat and calorie content. Here, both Nabong and Lao-Korea are not in current market while Nabong was Lao national milk brand before. Lao-Korea is the hypothetical milk product that is assumed to have a potential brand power from the bilateral cooperation between Korea and Laos.

Figure 4. An Example of Survey Questionnaire in Laos



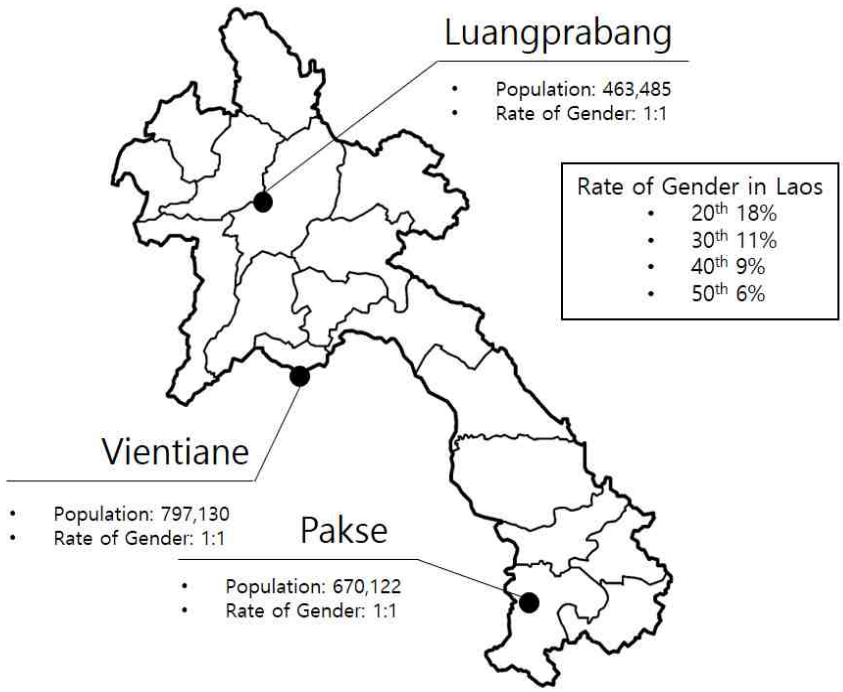
3.2 Survey Procedure

Based on in-depth interviews with the sale staffs working at store in the Vientiane capital in the spring of 2015, it is currently known that Laos has 3 popular milk brands, which are the Foremost, the Thai-Danish and the Meiji, and all are imported from Thailand. Consumers in Laos are still aware of their national dairy brand of Nabong even though it was closed in 2008 since it had been marketed for more than 10 years. and according to 2 times of pretest, there is only one brand of Lao milk can make bias, such as patriotism, from consumers who want to purchase milk product. the reason why adding one more additional brand is the Lao-Korea products. it is the hypothetical milk brand that is assumed to have a potential brand power resulted from Korea's aid activities in Laos. As a result, five milk brands are compared with one another for valuing attributes of fluid milk products as well as consumer's characteristics.

Actual survey was conducted from July 8th to August 18th, 2015, Figure 5. is map of survey area and general information. it was conducted in major cities of central, Southern and Northern; Vientiane, Pakse and Luang Prabang. In 2014, population ranged as followed: 797,130 for Vientiane, 670,122 for Pakse and 463,485 for Luang Prabang. Number of male and women were similar for all three cities. 20s counted for 18%, 30s for 11%, 40s for 9% and 50s for 6%, and children under 19 years old showed a very

high percentage. 400 for each city and 1300 people in total responded to the survey, and the survey was conducted at following date: Vientiane (2015.07.17), Pakse (7.23), Luang Prabang(8.5).

Figure 5. Map and General Information of Survey Area



Source: Lao Statistics Bureau

As shown in Table 5, this survey aimed to understand consumer's preference on Laos' dairy products. Survey was done through face-to-face interview, and there were 1,165 answers in total, excluding 35 errors. 416 men and 748 women responded to the survey. 10s&20s accounted for 735 respondents, with 364 for 30s&40s and 61 for 50s&60s. This survey was

done in Lao language, and 20 errors came from Pakse while 15 came from Luang Prabang, with not from Vientiane. This survey used the same questionnaire from 2nd pre-test.

Table 5. General Information of Survey

items	Contents
Purpose	Lao Consumers' Milk preference Survey
Method	Face to Face
Period	Vientiane: 17th Jul. 2015 - 18th Jul. (2days) Pakse: 22nd Jul. 2015 - 23rd Jul. (2days) Luangprabang: 4th Aug. 2015 - 5th Aug. (2days)
Number of Participants	1,165 (Male: 416, Female 748)
Age of Participants*	10th - 20th: 735 30th - 40th: 364 50th - 60th: 61
Language	Lao Language
Number of Errors	35 (Vientiane 0, Pakse, 20, Luangprabang 15)
Question	Same as Pretest

License is required to conduct research surveys in Laos, and it was acquired with help from Laos National Agriculture University. Location for survey and survey agents for each region were first selected, followed by orientation for survey agents before conducting actual survey.

Prior to actual survey, each cities were visited for the selection of suitable location for survey, and biggest markets in town were selected as the

location. Later, survey questionnaires for research were recruited. There were 7 questionnaires for Vientiane, 9 for Pakse and 8 for Luang Prabang. SNS or help of professors from local university were useful in recruitment. 50,000 Kip per day, small amount of traffic fare and lunch were provided for questionnaires. Those who participated after lunch time only received 30,000 Kip. Recruitment notice is attached behind this paper.

Orientation for questionnaires was conducted one day prior to actual survey. Orientation was conducted a day in each city. Research manager and purpose of research were introduced to recruited questionnaires. Information on nutrition status of Laos children were shared, and introduction on Laos' dairy product market and research method was done. Lastly, things to be considered during survey were shared, such as things to be careful of during questions, method of questioning and selection of wide range of respondents.

Vientiane

Actual survey in Vientiane was conducted on July 7th, 2015, from 9 am to 4 pm in Morning Market. Morning market is located in the center of Vientiane, and it is considered by most people as the center place of the city. Commercial district is formed around Morning market, and since bus stop is located right next to Morning market, it can work as center of traffic. Survey was conducted inside and around Morning market, subjects were selected randomly, and face-to-face interview was conducted for each

subjects. Morning market was selected as it deals with diverse products such as electronics, clothes, jewelries, is a place for people of every age, and is always crowded with people.

8 survey questionnaires participated in the process, with one of them being Korean and other 7 being local Laos questionnaire. survey was done in Vientiane. Light blue vest, pens as a souvenir for respondents, and a paper holder were distributed to survey questionnaires. Respondents ranged from late teens to 70s, and face-to-face interview was conducted for each respondent.

Pakse

Actual survey conducted in Pakse was from 22nd to 23rd of July, 2015 from 9 am to 4 pm in Dao Heouang Market. Dao Heouang Market is located in the center of Pakse, and is the biggest market in Pakse. Commercial district is formed around Dao Heouang, and since bus stop is located right next to Dao Heouang Market, it can work as center of traffic. Survey was conducted inside Dao Heouang Market, subjects were selected randomly, and face-to-face interview was conducted for each subjects.

10 survey questionnaires participated in the process, with one of them being Korean and other 9 being local Laos questionnaire. Fig. 10. shows how survey was done in Pakse. Unlike in the case of Vientiane, preliminary diary product market survey of Pakse was not enough. Therefore, first day was

spent walking around nearby grocery stores and studying the dairy product market. After that, pre-test was conducted around Champasak Plaza.

Luang Prabang

Actual survey conducted in Luang Prabang was conducted on August 5th, 2015, from 8:30 am to 4 pm in diverse markets of Luang Prabang. Unlike Vientiane or Pakse, markets in Luang Prabang were small and there weren't many floating population. It was considered more efficient to divide into teams and conduct survey. Therefore, all the survey questionnaires gathered in the center and then divided into three teams to conduct actual survey. 10 survey questionnaires participated in the process, with one of them being Korean and other 9 being local Laos questionnaire. Just as in Pakse, there was a research into dairy product market of Luang Prabang the day before by walking around nearby grocery stores.

3.3 Descriptive Summary for Survey Response

Table 6 provides summarized statistics for basic information obtained from the survey. A total 1,165 respondents participated in the survey. There are total 69,900 observations since each consumer responds to 10 questions with 6 choice options. There are 3 attributes which

Includes the price, the calorie and the fat as well as individual characteristics such as gender, age, whether or not to have kids in their family, level of education and income, previous consumption behavior, and location where respondents are living. For the gender, 36% of those participants are men while 64% are women. Average age for participants is 24.4 years, and people in their 20s are about 50% and those in 30s are 21.5%. Respondents living with their children under the age of 12 are 59%. Also, 81% of the respondents are graduated from high school. The average income ranges from 500,000 kip to 1,000,000 kip and most people purchase milk once a week on average.

Table 7 shows the actual frequencies for the selection of each brand from 1,165 respondents. Since 10 questions were given to each person with 6 possible options (or alternatives), the total number for 10 questions would be 11,650. In case of the frequency for each brand, Foremost shows

the highest rate of 29.73%, which is followed by Thai-Danish (22.09%), Nabong (15.92%), Meiji (15.35%), and Laos-Korea (10.39%) given the level of attributes shown in.

Table 6. Descriptive Summary for Survey Respondents

Variables	Number of Observation	Mean	Std. Dev.	Min	Max
Respondents	1,165	583	336.088	1	1,165
Products Attributes					
Brand (1 to 6)[1)]	69,900	3.5	1.7078	1	6
Price (0, 2, 3, 4, 5, 6)	69,900	3.3	1.9720	0	6
Fat (0, 4, 8, 12, 15)	69,900	6.5	5.7082	0	15
Calories (0, 110, 130, 150, 170, 190)[2)]	69,900	125	61.5769	0	190
Respondent's Individual Characteristics					
Gender 1 male, 0 female	69,840	0.36	0.48	0	1
Age (1, 2, 3, 4, 5, 6)	69,600	2.44	1.04	1	6
Kid 1 having kids, 0 otherwise	69,540	0.59	0.49	0	1
Education 1 Finish secondary school 0 otherwise	69,180	0.81	0.39	0	1
Income (1 to 7)[3)]	69,720	2.80	1.82	1	7
Milk Consumption Frequency 0 Rarely buy 1 1 to 2 times per week 2 3 to 4 times per week 3 5 to 6 times per week 4 Daily buy	69,720	1.09	1.24	0	4
Region 1 Vientiane, 2 Pakse, 3 Luangprabang	69,900	1.987	0.8208	1	3

1) 1: Foremost, 2: Nabong, 3: Thai-Danish, 4: Lao-Korea, 5: Meiji, 6: None

2) Unit of Price is thousand kip, Unit of fat is g, Unit of calories is Kcal

3) The gap of Income range is 500,000kip. The 1 value means less than 500,000kip per month, and the value 7 means more than 3,000,000kip per month.

Table 7. Frequencies for 10 Questions from 1,165 Respondents

	Questions										
	1	2	3	4	5	6	7	8	9	10	Total
Foremost	370 (31.76)	354 (30.39)	328 (28.15)	331 (28.41)	373 (32.02)	270 (23.18)	334 (28.67)	346 (29.70)	294 (25.24)	464 (39.83)	3,464 (29.73)
Nabong	209 (17.94)	165 (14.16)	144 (12.36)	283 (24.29)	191 (16.39)	159 (13.65)	177 (15.19)	111 (9.53)	243 (20.86)	173 (14.85)	1,855 (15.92)
Thai-Danish	271 (23.26)	265 (22.75)	351 (30.13)	229 (19.66)	227 (19.48)	262 (22.49)	200 (17.17)	316 (27.12)	225 (19.31)	228 (19.57)	2,574 (22.09)
Lao-Korea	81 (6.95)	99 (8.50)	106 (9.10)	122 (10.47)	109 (9.36)	132 (11.33)	207 (17.77)	148 (12.70)	107 (9.18)	100 (8.58)	1,211 (10.39)
Meiji	185 (15.88)	201 (17.25)	175 (15.02)	137 (11.76)	176 (15.11)	264 (22.66)	151 (12.96)	181 (15.54)	210 (18.03)	129 (11.07)	1,809 (15.35)
None	49 (4.21)	81 (6.95)	61 (5.24)	63 (5.41)	89 (7.64)	78 (6.70)	96 (8.24)	63 (5.41)	86 (7.38)	71 (6.09)	737 (6.33)
Total	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	1,165 (100.0)	11,650 (100.0)

4. Results

Conditional logit model fits McFadden's choice model, which is a specific case of the more general conditional logistic regression model (McFadden, 1973). Table 8 shows results of estimating random utility function for milk preferences in Laos using the (alternative-specific) conditional logit model from the command of "asclogit" in Stata.

Price and fat content affect negatively on Laos consumers' utility while calorie content increases the utility, and those attributes are all significant at 1% level. This finding indicates that if Lao government wants to promote milk consumption, controlling fat content is more important than calorie content since willingness to pay for an additional fat content is -775.9 kip (1,000 kip * -0.0270/0.0348), which is much higher in the absolute value than 48.9 kip (1,000 kip * 0.0017/0.0348) of willingness to pay for an additional calorie. Also, consumers in the developed country are more sensitive to fat taste of fluid milk even though it depends on their previous consumption behavior (McCarthy et al., 2017).

When it comes to the personal characteristics, male consumers are less likely to prefer milk products than females on average except the hypothetical brand of Laos-Korea that shows indifference between males

and females. It means that policy toward females for milk consumption would be more effective than males.

In terms of age groups, utility is reduced when consumers are getting old. For instance, the utility for Foremost that is the most popular in Laos shows a negative relationship with the consumers of their 20s, 30s and 40s compared to the 10s. It might be due to various substitutes for keeping their health status when people gets old. This result also provides a reasonable insight on the importance of policy toward young children when the government wants to increase milk consumption for their people's nutrition.

The level of education does not affect consumers' utility for fluid milk. However, consumers living with the children under the age of 12 tend to have a positive relationship with the utility compared to those without children. This indicates that parents recognize the importance of milk consumption for their kids and policy toward family with kids would be more effective than those without kids. This also proves that school feeding program for primary school can be a good policy for enhancing children's nutrition if the program works closely with the parents.

Consumers are less likely to enjoy their utility for fluid milk if they purchase it more per week, which indicates that Laos consumers are not satisfied with their current milk consumption. It might be due to low

quality of their milk product in the current market. Sterilized milk is mainly consumed in Laos so that policy promoting high quality of various milk products would be necessary for increasing consumer's satisfaction.

Consumers with higher income tend to prefer Meiji and Thai-Danish rather than Foremost and Nabong. Fluid milk of Meiji and Thai-Danish are usually imported from Thailand, however those have their national brand of Japan and Denmark, respectively and can be regarded as high quality products. Laos consumers with high income do not prefer their national brand of Nabong, which means that having national brand of developed country might be a good starting point if Lao government wants to promote its national milk industry.

Compared to the consumers in Vientiane, those in Luang Prabang are less likely to have their utility for the brand of Nabong, Lao-Korea and Meiji. In other words, consumers in Vientiane capital are more likely to buy milk products of Nabong, Lao-Korea and Meiji compared to the Luang Prabang. Thus, policy toward milk consumption focusing on Vientiane capital can be more effective than other cities.

In terms of brand power, Foremost shows the highest level of preferences followed by Nabong, Thai-Danish, Meiji and Lao-Korea based on the estimates of constant for each alternative. That is, consumers are more likely to buy real milk products especially Foremost that is the most

common brand in Laos. Consumers also show a strong preference on their national brand, Nabong on average even though it is not available in the current market, which means that Laos consumers have a tendency toward their national brand and Lao government has an advantage of having national milk company. This result can provide valuable insights on its national plan of the 8th NSEDP (2016~2020) for developing livestock industry in Laos.

Table 8. Random Utility Estimation Using Conditional Logit Model

Parameters	Foremost	Nabong	Thai-Danish	Lao-Korea	Meiji
Product's Attributes					
Price (1,000 kip)			-0.0348*** (0.0076)		
Calories			0.0017*** (0.0004)		
Fat			-0.0270*** (0.0022)		
Respondent's Individual Characteristics					
Constant	1.8904***	1.3813***	1.3411***	0.8822***	0.9848***
	(0.1846)	(0.1989)	(0.1895)	(0.2093)	(0.1984)
Gender (dummy)	-0.2023**	-0.2197**	-0.2582***	-0.0012	-0.2487***
	(0.0868)	(0.0929)	(0.0896)	(0.0989)	(0.0936)
20th	-0.4023***	-0.1797	-0.3457**	-0.0138	-0.0641
	(0.1347)	(0.1444)	(0.1392)	(0.1564)	(0.1458)
30th	-0.3032*	-0.1059	-0.2102	-0.0292	-0.3299*
	(0.1621)	(0.1738)	(0.1669)	(0.1873)	(0.1764)
40th	-0.5017***	-0.2940	-0.3207*	-0.3700*	-0.6748***
	(0.1828)	(0.1975)	(0.1873)	(0.2169)	(0.2027)
50th	0.2514	-0.0011	0.3960	-0.0525	-0.2210
	(0.2593)	(0.2846)	(0.2638)	(0.3096)	(0.2889)
60th	0.6835	0.1526	-0.8337	-2.0820*	-1.0531**
	(0.4883)	(0.5388)	(0.5229)	(1.1077)	(0.6505)
Kid	0.4657***	0.1856**	0.4253***	0.3175***	0.3802***
	(0.0846)	(0.0905)	(0.0872)	(0.0974)	(0.0911)
Education	-0.0062	0.0598	0.1015	-0.0957	0.0957
	(0.1067)	(0.1149)	(0.1103)	(0.1165)	(0.1164)
Income	-0.0202	-0.0046	0.04547*	0.0169	0.0720***
	(0.0258)	(0.0280)	(0.0264)	(0.0300)	(0.0277)
Frequency	-0.2120***	-0.1094***	-0.1230***	-0.1000***	-0.0704**
	(0.0316)	(0.0338)	(0.0323)	(0.0367)	(0.0338)
Pakse	-0.0204	-0.0187	-0.04273	-0.0017	0.0832
	(0.1070)	(0.1115)	(0.1104)	(0.1184)	(0.1136)
Luang prabang	0.0813	-0.6687***	0.08534	-0.6961***	-0.2097*
	(0.1023)	(0.1121)	(0.1051)	(0.1220)	(0.1107)
Observation :	68,700		Log Likelihood :		-18884.334
Wald Chi2 (63)	732.65		Prob > Chi2 :		0.0000

1) Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The command of “estate mfx” from Stata provides results of post-estimation of (alternative specific) conditional logit model shown in Table 9 that contains marginal effects of both products’ attributes and consumers’ characteristics.

When the price increases by 1 unit (1,000 kip), the probability of choosing a specific brand is expected to decrease by 0.74% for the brand of Foremost, 0.50% for Nabong, 0.58% for Thai-Danish, 0.32% for Lao-Korea and 0.44% for Meiji. Foremost is highly sensitive to the price changes while the hypothetical brand, Lao-Korea, is in the low level. when the fat increases by 1 unit (g), the probability decreases by 0.57% for Foremost, 0.38% for Nabong, 0.45% for Thai-Danish, 0.25% for Lao-Korea and 0.34% for the brand of Meiji. It seems that Laos consumers are more sensitive to fat content for Foremoast and Thai-Danish than others. On the other hand, when the calorie increases by 1 unit (kcal), the probability increases by 0.04% for Foremost, 0.02% for Nabong, 0.03% for Thai-Danish, 0.02% for Lao-Korea and 0.02% for the brand of Meiji. This seems to be a quite similar across milk brands.

In terms of individual characteristics, the probability of choosing each brand for males decreases by 1.38% for Thai-Danish and 2.0% for Lao-Korea over females. For those living with children under 12, the probability of selecting fluid milk increases by 3.34% for Foremost and

1.45% for Thai-Danish over those living without children while the probability for choosing Nabong reduces by 3.0%. In other words, parents with kids are more likely to buy Foremost and Thai-Danish and less likely to buy Nabong compared to the households without kids.

When the level of income increases by 1 unit (500,000 kip), the probability of choosing fluid milk decreases by 0.56% for Nabong while that of selecting Meiji increases by 0.66%. Therefore, Meiji is regarded as a normal good while Nabong is an inferior good. If consumers often purchase Foremost previously, the probability of buying it again decreases by 2.47% and it depends on consumers' previous behavior, which means that Foremost didn't have strong brand power even though it is quite popular in Laos.

Overall probabilities for selecting each brand at the mean level of all explanatory variables are 30.9% for Foremost, 17.48% for Nabong, 21.48% for Thai-Danish, 10.39% for Lao-Korea, and 15.0% for Meiji. It is proved that the most popular fluid milk in Laos is Foremost, followed by Thai-Danish, Nabong, Meiji and Lao-Korea, which is like frequencies for each brand shown.

Table 9. Marginal Effects for Attributes and Characteristics

Parameters	Foremost	Nabong	Thai-Danish	Lao-Korea	Meiji
Price	-0.0074*** (0.0016)	-0.0050*** (0.0011)	-0.0058*** (0.0013)	-0.0032*** (0.0008)	-0.0044*** (0.0010)
Calories	0.0004*** (0.0001)	0.0002*** (0.0001)	0.0003*** (0.0001)	0.0002*** (0.0000)	0.0002*** (0.0001)
Fat	-0.0057*** (0.0005)	-0.0038*** (0.0004)	-0.0045*** (0.0004)	-0.0025*** (0.0003)	-0.0034*** (0.0003)
Gender	-0.0026 (0.0096)	-0.0045 (0.0079)	-0.0138** (0.0083)	0.0200*** (0.0061)	-0.0082 (0.0071)
Kid	0.0334*** (0.0093)	-0.0300*** (0.0078)	0.0145* (0.0080)	-0.0041 (0.0060)	0.0034 (0.0069)
Education	-0.0128 (0.0115)	0.0043 (0.0098)	0.0142 (0.0102)	-0.0130* (0.0074)	0.0091 (0.0090)
Income	-0.0023 (0.0027)	-0.0056** (0.0023)	0.0038 (0.0024)	-0.0011 (0.0018)	0.0066*** (0.0021)
Frequency	-0.0247*** (0.0037)	0.0040 (0.0031)	0.0019 (0.0031)	0.0033 (0.0024)	0.0092 (0.0027)
Probabilities at the mean level	0.3090	0.1748	0.2148	0.1039	0.1500

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

5. Conclusion and Implication

5.1 Conclusion

This research provides the market information of milk products as well as a potential of children's nutritional enhancement in Laos. Because of difficulties in predicting market condition, Lao government needs to have a sustainable short-term and long-term strategy for establishing its own dairy industry. Even though Laos has the smallest milk market in Southeast Asia in terms of its level of consumption of dairy products, and the dairy market is rapidly developing, it is not easy to enter the market due to cheap rehydrate milk imported from Thailand. Therefore, this research suggests cooperation with Laos' college of agriculture, using South Korea's milk powder to develop dairy products together with Laos and South Korea. Laos' colleges of agriculture can develop professionals in the field of animal husbandry and raise funds for operation at the same time. Milk produced in this way can be distributed as a form of school meal in cooperation with NGOs or international organizations, thereby enhancing the nutritional status of Laos children. Dairy products made from distributed milk powder should focus more on enhancing its quality than winning in the competition of the market, since it is a food distributed to Laos children. Its' long term goal is to establish a

manufacturing plant in Laos, thereby possessing competitiveness and stabilizing its production and sales of milk. If this program settles successfully as expected, it would lead to higher possibility of the effective expansion of dairy industry based on secured marketability. This program's purposes should be a safe dissemination of milk for enhancement in child nutrition and establishing a basis for successful dairy industry. A successful result is expected once the support in basic research field such as researchers and analysis of dairy product market is ensured.

This study has its uniqueness in a sense that it provides parts of fluid milk information and consumers' awareness on their milk products in Laos, which has never done before in an academic research. Based on the results, the price, the brand, the amount of calorie and fat content are the most important factors when consumers decide to purchase fluid milk in Laos. Based on the survey conducted in 2015, the price affects negatively to consumers' utility, which is reasonable and intuitive compared to previous research done in China and Turkey. The amount of fat reduces consumers' utility on average, which means that consumers prefer low fat to high fat from fluid milk. Increasing the amount of calorie can provide more utility for consumers as it is definitely a source of energy. Since willingness to accept for an additional fat content is much higher than willingness to pay for an additional calorie in the absolute value, focusing on fat content is

more important than calorie if Lao government wants to promote fluid milk consumption for enhancing people's nutrition.

When it comes to brand power, consumers prefer existing brands to hypothetical one in the order of Foremost, Nabong, Thai-Danish, Meiji and Lao-Korea. The probability of buying the hypothetical product of Lao-Korea is 10.39% at the mean level of other explanatory variables, which indicates that there exists a potential brand power due to bilateral cooperation between two countries.

Laos national brand, Nabong has still a market power with the probability of 17.48% on average compared to others although it is not available at the current market. Therefore, the effect of policy toward promoting livestock and dairy industry promulgated in the 8th NSEDP(2016~2020) would be accelerated if the government project for enhancing that industry is linked with their previous national brand. Moreover, since consumers prefer only Meiji when their income increases based on its marginal effect, it is better to look into its quality and market strategy of that brand when Lao government establishes their own national brand again in the market.

Individual characteristics such as income, the gender, whether or not to live with kids, the frequency for purchasing fluid milk per week, age, and location are also significant factors for consumers' preference. Meiji

looks like a normal good while Nabong seems to be an inferior good. Females tend to increase their utility when they buy fluid milk compared to males. People living with children are more likely to buy fluid milk compared to those without children. Consumers are less likely to enjoy fluid milk if they often purchase it on average. Consumers' utility is reduced when they become old due to high possibility of having other various sources for their nutrition. Consumers living in Vientiane capital would be more likely to buy fluid milk of Nabong, Lao-Korea and Meiji compared to the Luang Prabang. Therefore, it would be more effective to focus on having a good national brand such as Meiji, female consumers, family with kids, high quality of milk products, the young generation, and Vientiane capital areas when Lao government promotes milk consumption with its national brand at the beginning.

Domestic diary industry has improved in both qualitative · quantitative aspects during the last 80 years and has contributed to enhancement in nutritional status, but its global competitiveness is still low. This is because the dairy industry has seen improvement based on government-led development policies. Market protective policy and production quota system was adopted to protect domestic market and farms, but this cause d weakness in global competitiveness. Researches to find solutions were conducted around late 2000, period of free trade and globalization, and

preceding research suggested an improve in supply-and-demand policy, productivity enhancement and expansion of consumption as possible solutions.(Lee, 2007). There were other arguments such as achieving market competitiveness by producing high-quality food products, shedding from simple manufacturing process through R&D.(Yang and Jeon, 2004). Recent researches focus on export of competitive functional native dairy products to foreign markets, usually China and East Asian countries(Jang and Jeon, 2011). The potential of our dairy products are seen in Southeast Asian nations if Korea's dairy product advances to the global market, which shows change in our dairy product's globalization strategy from correspondence to advancement(KOTRA, 2016)[1].

Therefore, South Korea's agricultural ODA should be approached in somewhat a different way compared to other fields. It would be ideal to supplement domestic agricultural industry's shortcomings, and at the same time, sharing agricultural experience and technology that we've accumulated until now. There are arguments that leftover domestic agricultural products should be used in ODA projects to stablize domestic agricultures, but there are many barriers since we need to follow international commerce rules when trading agricultural products, so it is

[1] 2017 Vietnam Market Expansion Strategy (2016)

important to find a more strategic approach considering international development aspect.

Until now, South Korea‘s ODA project has only lasted for few years and then was cut off. However, for sustainable operation, it is important to seek additional funding or establish sustainable system during the period of project. Also, it is hard to secure long-term support on single project led by organizations else than a country, considering the characteristics of ODA, so the project need to seek ways to acquire sustainable spontaneous system in a short period of time. Decreasing the amount of early investment and granting preferential support to profitable model would be pivotal factors for the success of the program.

This program plans to approach as followed. First of all, South Korea ‘s domestic dairy manufacturing company hoping to expand to Laos and Laos’ National University of Agriculture were assumed as potential business partners. This was because this program first aimed to raise professional researchers and establish basis for research in dairy field, and because South Korea‘s dairy manufacturing company can support the production of high-quality milk by providing milk powder and milk production technology. Considering Laos’ lack of basis for dairy farming, rehydrate milk adequate to Laos people using Korea‘s milk powder should be developed in the first phase. Early stage of production should be

introduced to schools, and by advertising as the cooperative brand with Korean companies' technologies, consumption of milk should be increased based on trust from parents. Milk produced through these process should be distributed to children through local school meals in cooperation with NGOs and international Organizations, and income from these phases should be used for maintenance of production process. When income is stabilized, it should be used for research of basic dairy business, and further discussion regarding the establishment of Laos' dairy industry's basis through continuous exchange of opinions between professionals of Korea and Laos.

There exists some criticism and production of dehydrated milk can negatively affect local farms. However, there are only few farms producing dairy products in Laos, and there aren't any Laos local farms showing competitiveness against dairy products imported from Thailand. Also, dehydrated milk is completely different from fresh milk produced in local dairy farms. Dehydrated milk, while long-lasting, shows no competitiveness in taste compared to fresh milk. Milk market usually shows trend moving from dehydrated milk to fresh milk, and because low-price dehydrated milk can directly be linked to a bigger size of market adequate for fresh milk, dehydrated milk should rather be considered as a complementary product than a competitive one.

In case of Korean companies, they consider ODA businesses to be more of a charitable work. However, if approaching to recipient nation's market with a practical and feasible model, it would become a great chance to advertise our companies in the markets of developing nations. Also, since the potential value of Southeast Asian market is rapidly increasing, it will become a great opportunity for our companies to expand its market to Southeast Asian countries, just like how other foreign multinational companies are pursuing business advance through ODA.

5.2 Implication

UN stresses comprehensive cooperation in SDGs. If Korean companies contribute to the establishment of industrial basis of a recipient country on UN's advice, it will be a chance to prove cooperation and expandability of our agricultural ODA and domestic agriculture industry. Korean companies participated in ODA will be positively affected in two. First, their participation will help overcome the barriers to expansion of ODA funding. Second, problems affiliated to domestic agriculture industry could partially be solved through foreign ODA.

There are four important implications for milk cooperation between Korea and Laos. First of all, enhancement in child nourishment can be a starting point. Laos has been designing and pursuing solutions of its

severe malnutrition by stating it as one of primary national goal. Specifically, problems regarding Lao youngsters should quickly be solved due to hyposomia and low-weight caused by malnutrition. This research suggests milk, which helps child growth, as a primary solution to malnutrition problem, and plans to proceed in effectively. Lao dairy market is analyzed to position in its first formation phase. Thus, high expansion is expected, thereby being analyzed as a bossiness with bright prospect.

Second, there, high level of education institution in Laos, is suitable partner for academically exchange model in agricultural field. Diverse agents should participate and carry out their own works for successful business. This research suggests higher education institution in Laos as a local organization to run the project, a Korean dairy product company with high-quality technology, and research organization to analyze and correspond to Laos dairy market as major agents. Moreover, experiences of universities in Korea regarding production of dairy products will allow diverse types of cooperation with local higher education institution. With early market stepping into a stable phase, academic exchange between two nations through professionals raised during proceeding phases could be pursued, thereby achieving primary goals.

Third, inviting Korean dairy product companies in Laos is one of solutions. Companies can consider possibility of market penetration, and at the same time, enhance its brand image through charitable social work. Laos' dairy market, laying in the early formation phase, is relatively less competitive. Moreover, most of milk are imported from Thailand. Dairy products from Thailand states both local company's name and foreign company's name at the same time to present trust to Lao consumer. It means that Laos would be able to use the similar strategy through printing a cooperative brand of Laos and Korea, thereby gaining trust among consumers.

Forth, establishment of sustainable dairy industry's foundation can be reached. A final goal of this business to build fundamental structure for Laos' dairy industry by spreading our advanced technology. Formation of basic industry in Laos' dairy market is nearly impossible due to lack of market information. Thus, it brings underestimation of milk preference. More strategic and progressive approach is required to approach the market. Specific analysis on Laos' dairy market and dairy farming environment, and expanding the market through dehydrated milk made from low-price milk powder is pivotal in the early stages. Korean dairy product companies could participate in this phase to support technologies and distribute milk to local schools for the purpose of enhancing children's nutritional status. Cost required during these phases could be gained from

International organizations and NGOs. If the production and distribution of dairy products are stabilized, research regarding dairy industry should be expanded based on accumulated data.

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Appendix

Appendix 1. SAS Code for Fractional Factorial Design

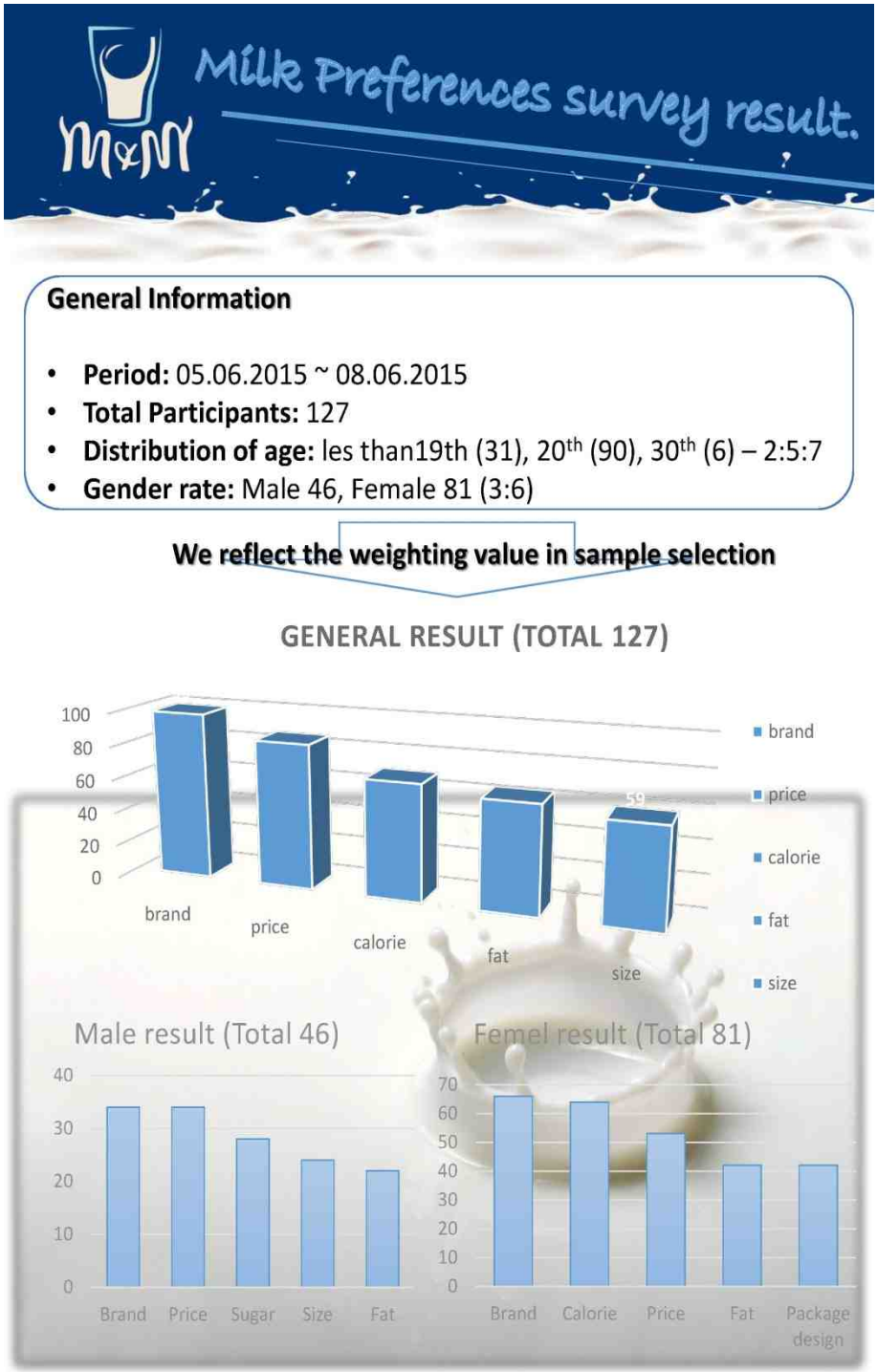
```
proc factex;
 factors fat kcal price/nlev=4;
size design=64;
blocks nblocks=4;
 model resolution=max;
 examine design;
output out=wtpexperiment randomize(711)
          fat cvals=('0' '4' '9' '15')
                        kcal cvals=('130' '150' '170' '190')
                        price cvals=('2000' '3000' '4000' '5000' );
run;
```

Appendix 2. Result of Fractional Factorial Design

SAS System

OBS	BLOCK	fat	kcal	price	OBS	BLOCK	fat	kcal	price
1	2	9	150	4000	33	4	15	150	3000
2	2	4	130	2000	34	4	4	190	2000
3	2	0	150	2000	35	4	4	150	5000
4	2	4	150	3000	36	4	15	190	4000
5	2	15	150	5000	37	4	4	170	3000
6	2	4	170	5000	38	4	0	150	4000
7	2	0	130	3000	39	4	4	130	4000
8	2	15	130	4000	40	4	9	190	5000
9	2	0	190	5000	41	4	9	150	2000
10	2	15	190	2000	42	4	9	170	4000
11	2	9	190	3000	43	4	9	130	3000
12	2	9	170	2000	44	4	0	190	3000
13	2	15	170	3000	45	4	0	130	5000
14	2	9	130	5000	46	4	15	130	2000
15	2	0	170	4000	47	4	15	170	5000
16	2	4	190	4000	48	4	0	170	2000
17	1	0	170	3000	49	3	0	170	5000
18	1	9	150	3000	50	3	15	130	5000
19	1	0	130	4000	51	3	0	130	2000
20	1	0	150	5000	52	3	4	190	5000
21	1	9	190	4000	53	3	4	150	2000
22	1	9	130	2000	54	3	4	170	4000
23	1	15	130	3000	55	3	9	150	5000
24	1	4	190	3000	56	3	15	170	2000
25	1	4	170	2000	57	3	0	190	4000
26	1	4	150	4000	58	3	4	130	3000
27	1	4	130	5000	59	3	9	130	4000
28	1	15	170	4000	60	3	9	190	2000
29	1	9	170	5000	61	3	0	150	3000
30	1	15	150	2000	62	3	15	150	4000
31	1	0	190	2000	63	3	15	190	3000
32	1	15	190	5000	64	3	9	170	3000

Appendix 3. Result for Milk Preference Survey



Appendix 4. Pretest Survey

ມະຫາວິທະຍາໄລແຫ່ງຊາດ ໂຊອຸນ ສ.ເກົາຫລີ ການສຳຫລວດຄວາມຕ້ອງການຂອງຜູ້ບໍລິໂພກໃນປະເທດລາວ Seoul National University Consumer Preference Survey

ການຄົ້ນຄວ້ານີ້ ແມ່ນເພື່ອສ້າງຄວາມເຂົ້າໃຈຜູ້ບໍລິໂພກນົມ ໃນປະເທດລາວໃຫ້ຫລາຍຂຶ້ນ, ນ່າພາໂດຍ ອາຈານ ຄິມແທ ຢູນ ແລະ ນັກສຶກສາປະລິນຍາໂທ ລີ ເຈອອນ ຈາກຄະນະ ເຕັກໂນໂລຊີກະສິກຳສາກົນ ມະຫາວິທະຍາໄລແຫ່ງຊາດໂຊອຸນ ສ.ເກົາຫລີ. ສ່ວນຮ່ວມ ໃນການໃຫ້ຂໍ້ມູນຂອງທ່ານຈະຊ່ວຍສະໜັບສະໜູນການວິເຄາະດ້ານການກະສິກຳຂອງປະເທດລາວ.

ສະຖານະການສົມມຸດ, ຖ້າທ່ານກຳລັງເລືອກຊື້ນົມຢູ່ຕາມຕະຫລາດ ຫລື ຮ້ານຄ້າທ້ອງຖິ່ນ, ໃນຮ້ານດັ່ງກ່າວທ່ານສາມາດສັ່ງເກດເຫັນມີ 4 ທາງເລືອກໃຫ້ທ່ານຕັດສິນໃຈ ໃຫ້ທ່ານເລືອກອັນໃດໜຶ່ງທີ່ທ່ານຕ້ອງການຈະຊື້. ຕົວຢ່າງ: ຖ້າທ່ານຕັດສິນໃຈເລືອກຕົວເລືອກທີ 3 ໃຫ້ເລືອກໝາຍເລກ 3 , ຖ້າທ່ານບໍ່ຕ້ອງການຊື້ທັງໝົດ ທ່ານສາມາດເລືອກ None.

ໝາຍເຫດ: ໃນຕາຕະລາງໜຶ່ງກ່ານົດໃຫ້ເລືອກພຽງຕົວເລືອກດຽວເທົ່ານັ້ນ.

This research aims to make better understand Lao's consumer's preference on milk, which is conducted by Prof. KIM, TaeYoon and Master' student LEE, Jae-Won from Graduate School of International Agricultural Technology at Seoul National University, Republic of Korea. Your participation will help us to study Laos Agriculture.

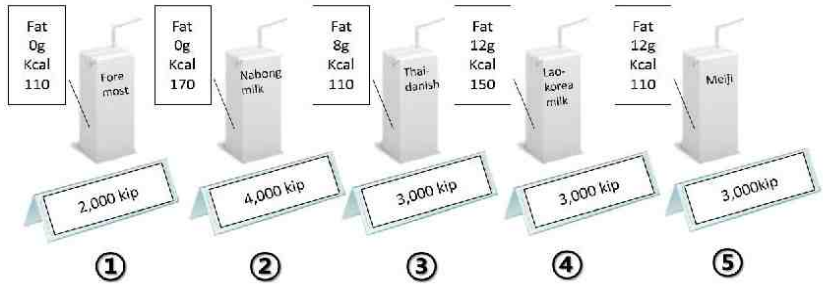
Imagine now if you are at a local supermarket/convenience store for a shopping in Laos. There, you can see four different options of milk products. During your shopping, please decide which option is the best choice for you. Please kindly check ONLY ONE of these four options for each table. However, if you are not willing to buy any of these 4 options please check NONE section. Example: if you decide to buy option 3, select third section, as you can see the example table below.

<Example Test>

Brand	Made in	Collaboration with	Remarks
Foremost	Made in Thailand	Netherlands	Real product
Nabong	Made in Laos	Own Lao	
Thai-Danish	Made in Thailand	Denmark	Real product
Lao-Korea	Made in Laos	Korea	
Meiji	Made in Thailand	Japan	Real product

<1>

Q.1



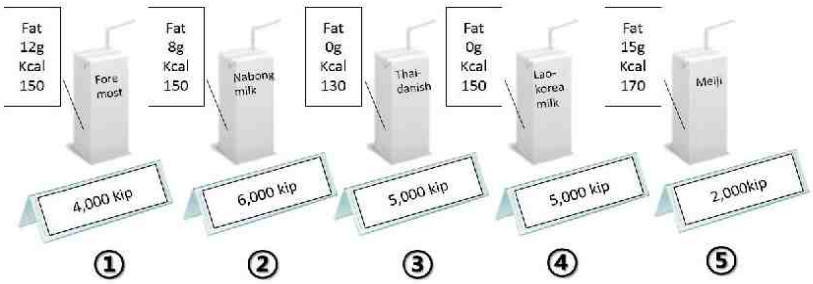
None:
I Would not Purchase any of these products → ⑥ None

1. **<1>**
   Choose which one you want to buy or none.
   한 개의 타원형만 표시합니다.

   ◯ ①
   ◯ ②
   ◯ ③
   ◯ ④
   ◯ ⑤
   ◯ ⑥ NONE

<2>

Q.2



None:
I Would not Purchase any of these products → ⑥ None

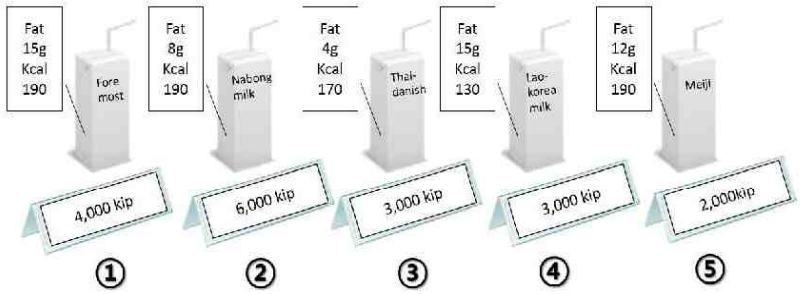
2. **<2>**

Choose which one you want to buy or none.
한 개의 타원형만 표시합니다.

- ◯ ①
- ◯ ②
- ◯ ③
- ◯ ④
- ◯ ⑤
- ◯ ⑥ NONE

<3>

Q.3



None:
I Would not Purchase any of these products → **⑥ None**

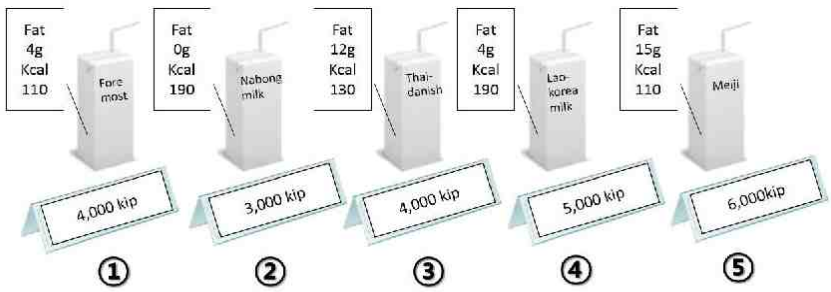
3. **<3>**

Choose which one you want to buy or none.
한 개의 타원형만 표시합니다.

- ◯ ①
- ◯ ②
- ◯ ③
- ◯ ④
- ◯ ⑤
- ◯ ⑥ NONE

<4>

Q.4



None:
I Would not Purchase any of these products ⑥ None

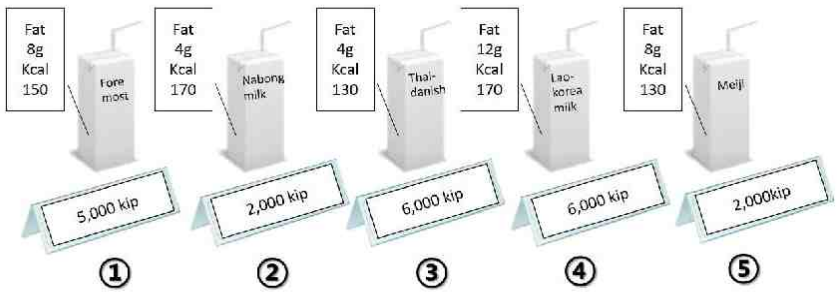
4. **<4>**

Choose which one you want to buy or none.
한 개의 타원형만 표시합니다.

- ○ ①
- ○ ②
- ○ ③
- ○ ④
- ○ ⑤
- ○ ⑥ NONE

<5>

Q.5



None:
I Would not Purchase any of these products → ⑥ None

Appendix 5. Survey Questionnaires (English Version)

Seoul National University Consumer Preference Survey

ID				

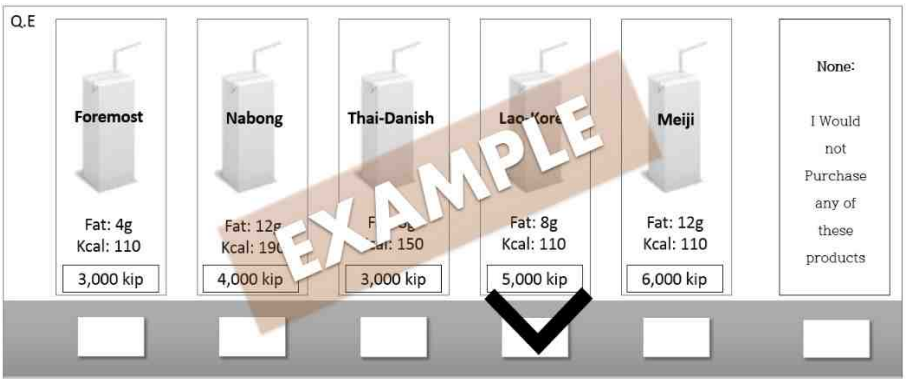
This research aims to make better understand Lao's consumer's preference on milk, which is conducted by Prof. KIM, TaeYoon and Master' student LEE, Jae-Won from Graduate School of International Agricultural Technology at Seoul National University, Republic of Korea. Your participation will help us to study Laos Agriculture.

Seoul National University Graduate School of International Agricultural Technology

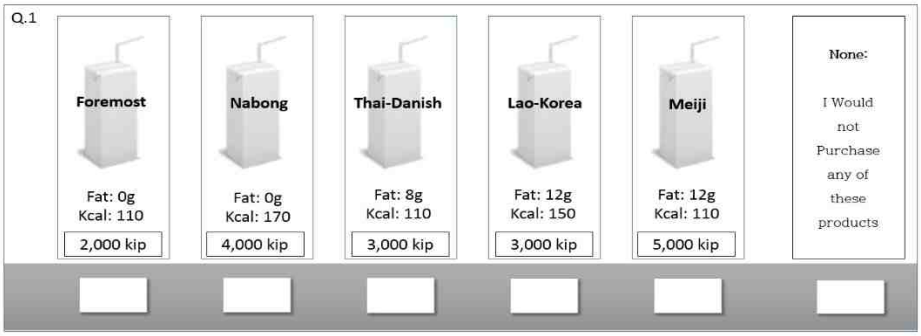
Professor. Taeyoon Kim(taeyoonkim@snu.ac.kr)

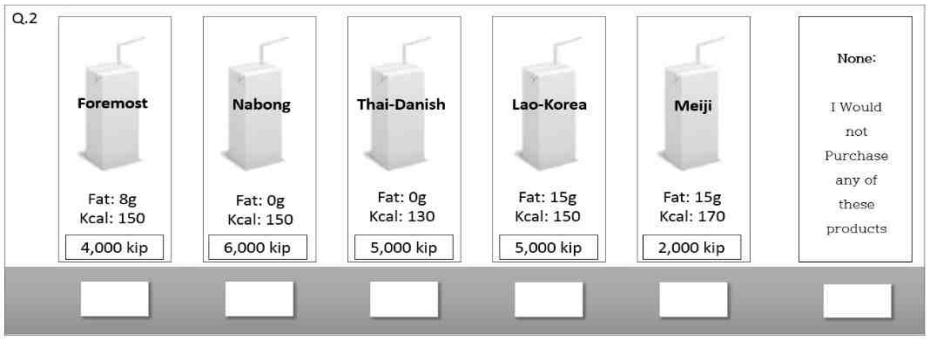
Researcher. Jay Lee(020-5970-2006)

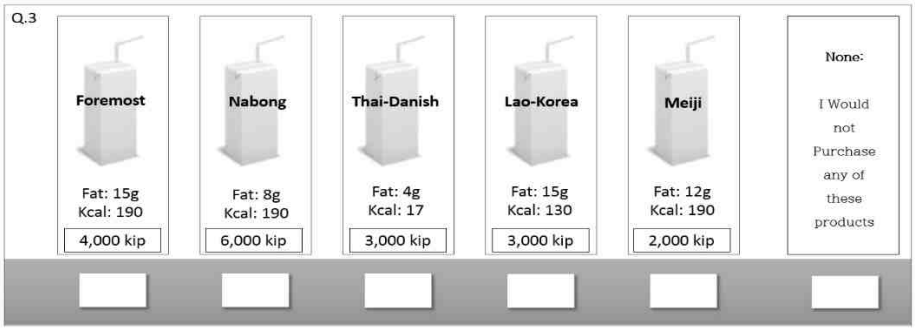
Imagine now if you are at a local supermarket/convenience store for a shopping in Laos. There, you can see four different options of milk products. During your shopping, please decide which option is the best choice for you. Please kindly check ONLY ONE of these four options for each table. However, if you are not willing to buy any of these 5 options please check NONE section. Example: if you decide to buy Lao-Korea brand, select Fourth section, as you can see the example table below.

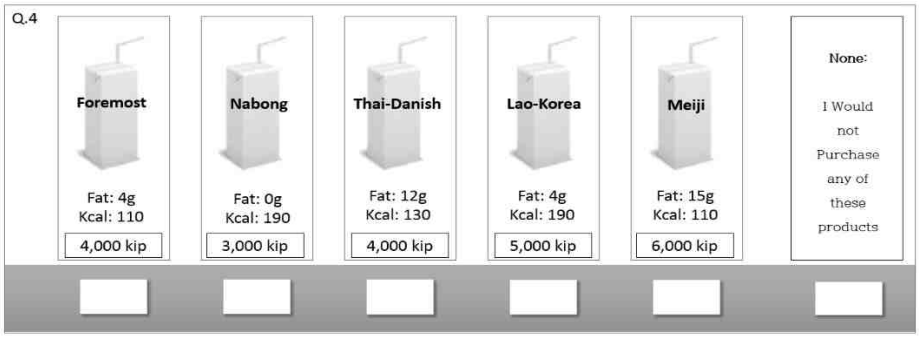


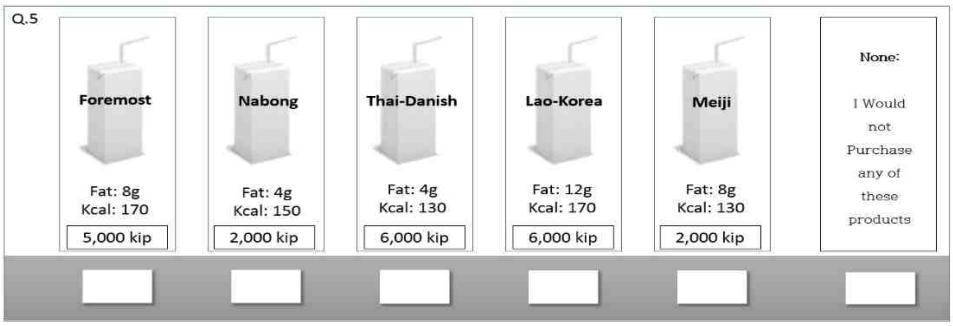
Brand	Made in	Collaboration with	Remarks
Foremost	Made in Thailand	Netherlands	Real product
Nabong	Made in Laos	Own Lao	
Thai-Danish	Made in Thailand	Denmark	Real product
Lao-Korea	Made in Laos	Korea	
Meiji	Made in Thailand	Japan	Real product

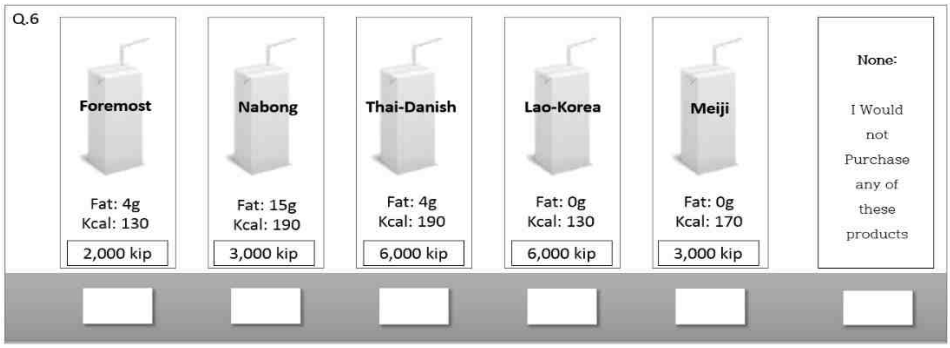

Q.1
Foremost
Fat: 0g
Kcal: 110
2,000 kip
Nabong
Fat: 0g
Kcal: 170
4,000 kip
Thai-Danish
Fat: 8g
Kcal: 110
3,000 kip
Lao-Korea
Fat: 12g
Kcal: 150
3,000 kip
Meiji
Fat: 12g
Kcal: 110
5,000 kip
None:
I Would not Purchase any of these products

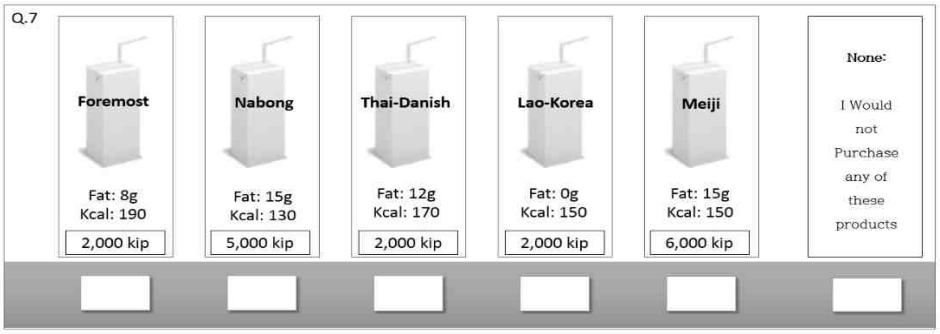

Q.2
Foremost
Fat: 8g
Kcal: 150
4,000 kip
Nabong
Fat: 0g
Kcal: 150
6,000 kip
Thai-Danish
Fat: 0g
Kcal: 130
5,000 kip
Lao-Korea
Fat: 15g
Kcal: 150
5,000 kip
Meiji
Fat: 15g
Kcal: 170
2,000 kip
None:
I Would not Purchase any of these products

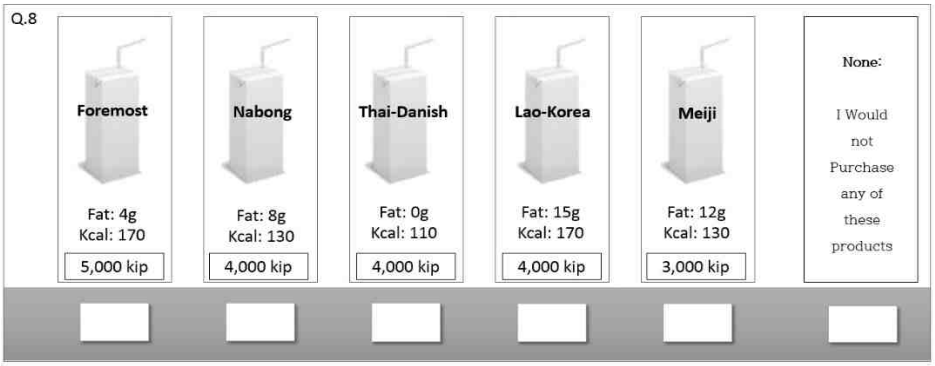

Q.3
Foremost
Fat: 15g
Kcal: 190
4,000 kip
Nabong
Fat: 8g
Kcal: 190
6,000 kip
Thai-Danish
Fat: 4g
Kcal: 17
3,000 kip
Lao-Korea
Fat: 15g
Kcal: 130
3,000 kip
Meiji
Fat: 12g
Kcal: 190
2,000 kip
None:
I Would not Purchase any of these products

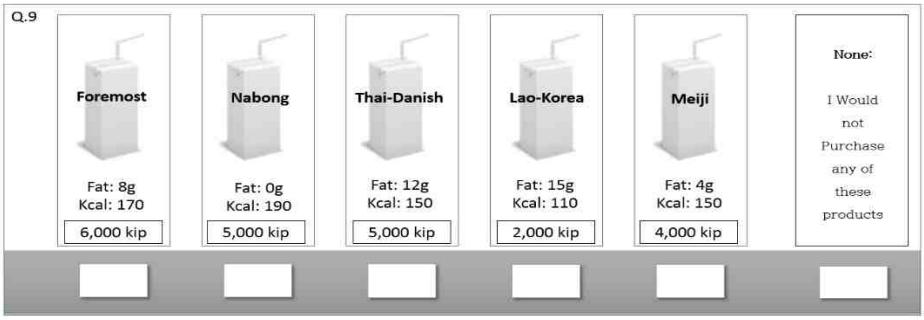

Q.4
Foremost
Fat: 4g
Kcal: 110
4,000 kip
Nabong
Fat: 0g
Kcal: 190
3,000 kip
Thai-Danish
Fat: 12g
Kcal: 130
4,000 kip
Lao-Korea
Fat: 4g
Kcal: 190
5,000 kip
Meiji
Fat: 15g
Kcal: 110
6,000 kip
None:
I Would not Purchase any of these products

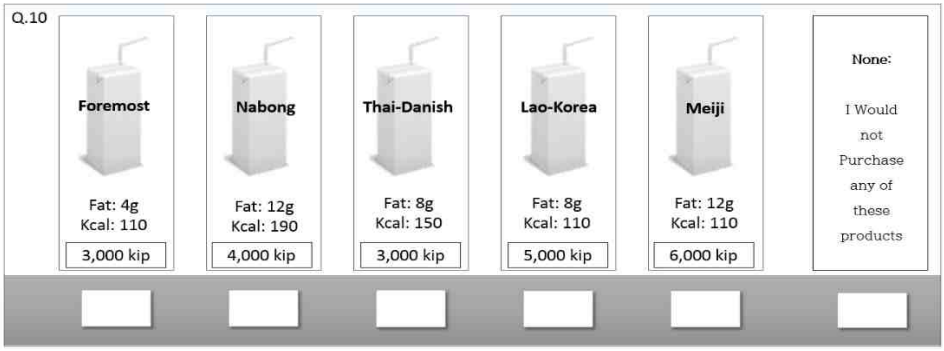

Q.5
Foremost
Fat: 8g
Kcal: 170
5,000 kip
Nabong
Fat: 4g
Kcal: 150
2,000 kip
Thai-Danish
Fat: 4g
Kcal: 130
6,000 kip
Lao-Korea
Fat: 12g
Kcal: 170
6,000 kip
Meiji
Fat: 8g
Kcal: 130
2,000 kip
None:
I Would not Purchase any of these products


Q.6
Foremost
Fat: 4g
Kcal: 130
2,000 kip
Nabong
Fat: 15g
Kcal: 190
3,000 kip
Thai-Danish
Fat: 4g
Kcal: 190
6,000 kip
Lao-Korea
Fat: 0g
Kcal: 130
6,000 kip
Meiji
Fat: 0g
Kcal: 170
3,000 kip
None:
I Would not Purchase any of these products


Q.7
Foremost
Fat: 8g
Kcal: 190
2,000 kip
Nabong
Fat: 15g
Kcal: 130
5,000 kip
Thai-Danish
Fat: 12g
Kcal: 170
2,000 kip
Lao-Korea
Fat: 0g
Kcal: 150
2,000 kip
Meiji
Fat: 15g
Kcal: 150
6,000 kip
None:
I Would not Purchase any of these products


Q.8
Foremost
Fat: 4g
Kcal: 170
5,000 kip
Nabong
Fat: 8g
Kcal: 130
4,000 kip
Thai-Danish
Fat: 0g
Kcal: 110
4,000 kip
Lao-Korea
Fat: 15g
Kcal: 170
4,000 kip
Meiji
Fat: 12g
Kcal: 130
3,000 kip
None:
I Would not Purchase any of these products


Q.9
Foremost
Fat: 8g
Kcal: 170
6,000 kip
Nabong
Fat: 0g
Kcal: 190
5,000 kip
Thai-Danish
Fat: 12g
Kcal: 150
5,000 kip
Lao-Korea
Fat: 15g
Kcal: 110
2,000 kip
Meiji
Fat: 4g
Kcal: 150
4,000 kip
None:
I Would not Purchase any of these products


Q.10
Foremost
Fat: 4g
Kcal: 110
3,000 kip
Nabong
Fat: 12g
Kcal: 190
4,000 kip
Thai-Danish
Fat: 8g
Kcal: 150
3,000 kip
Lao-Korea
Fat: 8g
Kcal: 110
5,000 kip
Meiji
Fat: 12g
Kcal: 110
6,000 kip
None:
I Would not Purchase any of these products

Profile

these question beow are used for research ONLY.

1. Gender

☐ Male, ☐ Female

2. Age

☐ Younger than 19th , ☐ 20 ~ 29, ☐ 30 ~ 39

☐ 40 ~ 49, ☐ 50 ~ 59, ☐ Over 60th

3. Do you live with children under the age of 12, including cousin.

☐ Yes ☐ No

4. Did you graduate your secondary school?

☐ Yes ☐ No

5. How many times do you buy milk per week?

☐ 1 ~ 2 times/ week, ☐ 3 ~ 4 times/ week

☐ 5 ~ 6 times/ week, ☐ 7times/ week, ☐ Not used to drink

6. How much do you earn monthly?

☐ Less than 500,000, ☐ 500,000 ≤ 〈1,000,000,

☐ 1,000,000 ≤ 〈1,500,000, ☐ 1,500,000 ≤ 〈2,000,000

☐ 2,000,000 ≤ 〈2,500,000, ☐ 2,500,000 ≤ 〈3,000,000

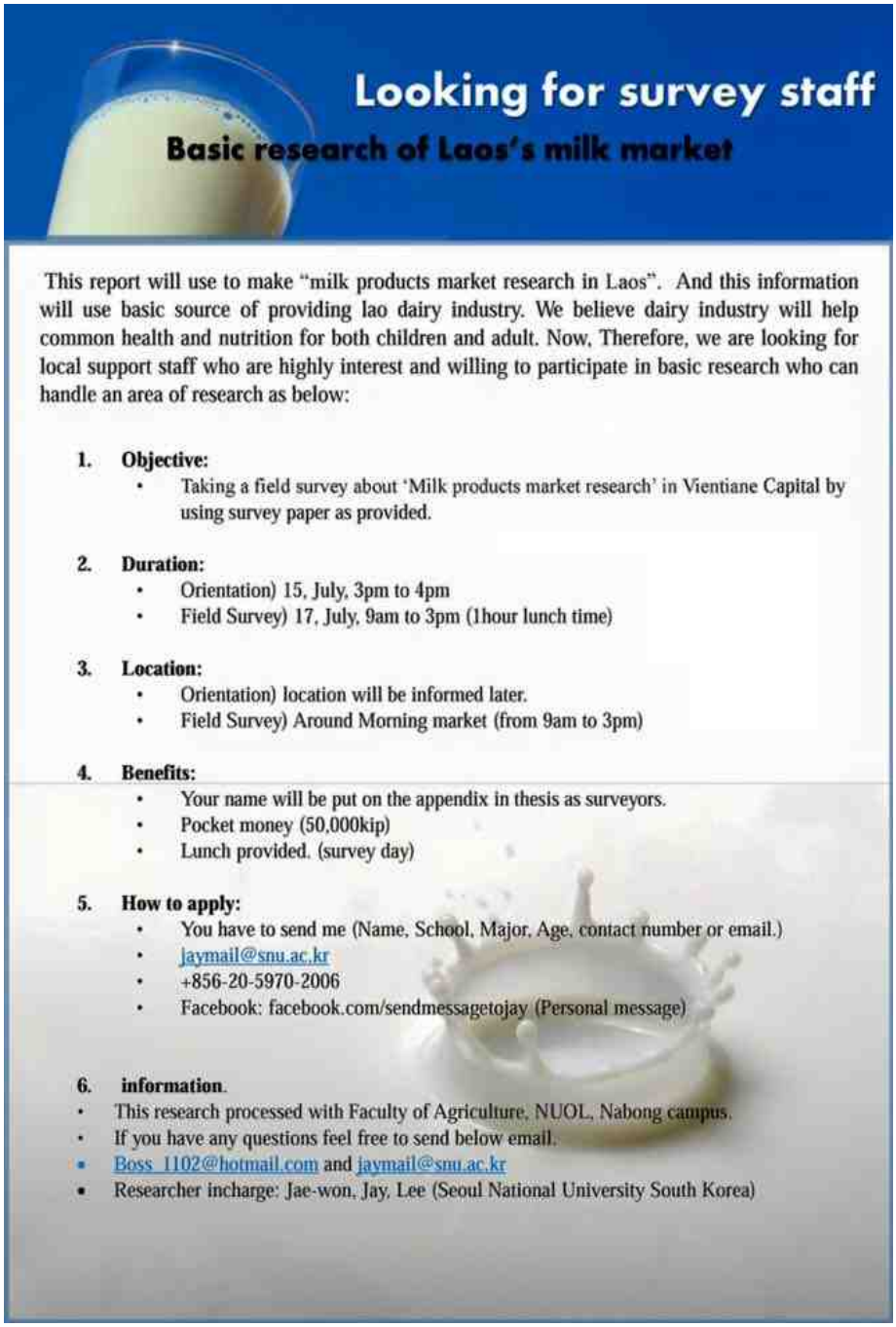
☐ more than 3,000,000

Thank you for your time! The result paper will be made in July.

Appendix 6. Notification for Research Staffs in Laos

1. Lao Version

2. English Version



Appendix 7. Main Milk products in Vientiane Market in 2015

			
Name	Meiji	Meiji	Meiji
Made in	Thailand	Thailand	Thailand
Processed Form	Pasteurization	Pasteurization	Pasteurization
Cost	12,000 Kip (30 kip/ml)	29,000 Kip (14.5 kip/ml)	29,000 Kip (14.5 kip/ ml)
Size	400ml	2,000ml	2,000ml
Calorie	140Kcal	90Kcal	15Kcal
Milk Sugar	8g/ 12%	2.5g/ 4%	8g/ 12%
Saturated Fat	5g/ 25%	1.5g/ 8%	5g/ 25%
Cholesterol	25mg	10mg	25mg
Carbohydrate	10g/ 3%	10g/ 3%	10g/ 3%
Sugar	9g	10g	9g
Natrium	90mg	90mg	90mg

			
Name	Dutch Mill	Foremost	Nongpho
Made in	Thailand	Thailand	Thailand
Processed Form	Pasteurization	UHT	UHT
Cost	29,000 Kip (14.5 kip/ml)	4,000 Kip (20 kip/ml)	4,000 Kip (16 kip/ml)
Size	2,000ml	200ml	250ml
Calorie	130 Kcal	130 Kcal	170 Kcal
Milk Sugar	6g/ 9%	6g/ 9%	10g/ 15%
Saturated Fat	3g/ 15%	4g/ 20%	4.5g/ 23%
Cholesterol	15mg	20mg	30mg
Carbohydrate	12g/ 6%	11g/ 4%	14g/ 5%
Sugar	7g	9g	8g
Natrium	110mg	80mg	110mg

			
Name	Hi-Q	Chokchai Farm	Thai-Danish farm
Made in	Thailand	Thailand	Thailand
Processed Form	UHT	UHT	UHT
Cost	3,000 Kip (16.6 Kip/ml)	3,000 Kip (15 Kip/ml)	3,000 Kip (15 Kip/ml)
Size	180ml	200ml	200ml
Calorie	130 Kcal	130 Kcal	150 Kcal
Milk Sugar	60 Kcal	60 Kcal	70 Kcal
Saturated Fat	7g/ 11%	6g/ 9%	7g/ 11%
Cholesterol	15mg	20mg	25mg
Carbohydrate	12g/ 4%	11g/ 4%	17g/ 6%
Sugar	8g	9g	12g
Natrium	70mg	80mg	80mg

			
Name	**Nestle Bear**	**Thai-Danish Farm**	**Anlene**
Made in	Thailand	Thailand	Thailand
Processed Form	UHT	UHT	UHT
Cost	3,000 Kip (21.4 kip/ml)	3,000 Kip (15 kip/ml)	3,000 Kip (16.6 kip/ml)
Size	140ml	200ml	180ml
Calorie	50 Kcal	130 Kcal	70 Kcal
Milk Sugar	0 Kcal	70 Kcal	0 Kcal
Saturated Fat	0g/ 0%	8g/ 12%	0g/ 0%
Cholesterol	0g/ 0%	4, 5g/ 22%	0g/ 0%
Carbohydrate	5mg	25mg	5mg
Sugar	7g/ 2%	7g/ 2%	11g/ 4%
Natrium	6g	5g	10g

Appendix 8. Summary and Result of Milk Preference test

Items	Contents
Purpose	Lao Consumer's Preference of attributes for milk Products
Method	Internet
Period	5th June 2015 - 8th June 2015
Number of Participants	127
Language	Lao Language / English
Age of Participants	Under 19 : 31, 20th : 90, 30th : 6
Attributes Selection	Market analysis and interview with merchandizes
Selection Attributes	1.Process type of milk 2.Brand 3.Package design 4.Preserved type 5.Size 6.fat 7.Calorie 8.Fat 9.Cooperation with Advanced technology 10.Price
Questions	Select 5 attributes among 10 attributes

Rank	Attributes	Result
Result for top 4 attributes		
1.	Brand	78%
2.	Price	68%
3.	Calorie	54%
4.	fat	50%
Gender	Male	Female
1.	Brand	Brand
2.	Price	Calorie
3.	Calorie	Price
4.	Size	fat

Appendix 9. Summary and Result of Milk 1st Pre-test

1) Example of 1st Pre-test Questionnaires

Variable	〈1〉	〈2〉	〈3〉	〈4〉
Brand	Foremost Dutch	Thai-Danish Denmark	Meiji Japan	Lao-Korea Korea
fat	0g	4g	9g	15g
Calorie	130kcal	150kcal	170kcal	190kcal
Price	2,000 Kip	3,000 Kip	4,000 Kip	5,000 Kip

2) Summary of Milk 1st Pre-test

	Contents
Purpose	Pre-test for Actual Test
Method	Internet
Period	18th June 2015 ~ 21st June 2015
Number of Participants	66 (Male: 28, Female: 38)
Age of Participants	Under 19: 8 20th: 57 50th: 1
Language	Lao language and English
Number of Error	6
Question	Select one product that you want to buy 1 person has 4 questions and select 1 option among 5 options

3) Result of 1st Pre-test Survey

Brand	Parameter Estimates			
	Parameter	DF	Estimate	Standard Error
Price	PR	1	-0.000148	9.81E-05
fat	Fat	1	-0.072***	0.0164
Calorie	Cal	1	-0.003922	0.005146
Thai-Danish	DTC	1	3.4265***	1.013
Thai-Netherland	DMK	1	3.0144**	0.9427
Meiji	JPN	1	3.4005***	0.909
Lao-Korea	Lao-KOR	1	3.1667**	0.9837

Appendix 10. Summary and Result of Milk 2st Pre-test

1) Example for 2nd pre-test

Variable	〈1〉	〈2〉	〈3〉	〈4〉	〈5〉
Brand	Foremost Dutch	Lao Nabong	Thai-Danish Denmark	Meiji Japan	Lao-Korea Korea
fat	0g	4g	8g	12g	15g
Calorie	110kcal	130Kcal	150kcal	170kcal	190kcal
Price	2,000 Kip	3,000 Kip	4,000 Kip	5,000 Kip	6,000 Kip

2) Summary 2nd pre-test

	Contents
Purpose	Pretest for Actual test
Method	Face to Face
Period	6th July 2015
Number of Participants	190 (Male: 111, Female 79)
Age of Participants	Under 19: 31, 20th: 138, 30th: 21
Language	Lao Language
Question	Select one product that you want to buy 1 person has 10 questions and select 1 option among 6 options

3) Result of 2nd Pre-test

Variable	Estimate	Standard error
Price	-0.175***	0.0186
fat	-0.0196***	0.004559
Calorie	-0.003229***	0.000892
Thai-Netherland	3.6208***	0.3872
Lao (Nabong)	4.7919***	0.3911
Thai-Denmark	3.7194***	0.3854
Lao-Korea	4.6483***	0.3852
Thai-Japan	3.4141***	0.3897

Appendix 11. Pictures of Survey

	
Pretest on Field	Pretest on Class
	
Survey Tool	Survey Actilities
	
Luangprabang Group Picture	Luangprabang Hospital

국문요약(국문초록)

라오스 우유 시장은 인구 및 경제 규모에 비추어 작다고 평가되며 낙농 산업은 크게 발달하지 못했다. 대부분의 우유는 수입에 의존하고 있으며 태국과 베트남에서 주로 가져온다. 라오스 정부는 낙농 산업 발전을 위해 여러 차례 시도하였지만 실패하였고 2008 년 나봉 우유의 폐업은 대표적인 사례로 여겨진다. 라오스 정부의 발전 계획을 보면 지속적으로 낙농 산업 발전 의지가 있음을 알 수 있다. 본 연구는 라오스 일반 소비자 1,165 명을 대상으로 조사하였으며 유제품의 특징과 소비자 특성에 따라 변화하는 효용을 구하고자 하였다. 실제 판매하고 있는 제품과 가상의 브랜드를 혼합하여 질문지를 구상하였으며 실제 판매되고 있는 태국에서 수입되는 3 가지 제품과 과거 판매된 경험이 있는 라오스 나봉 브랜드와 한국-라오스 기술협력 제품을 가상 브랜드로 포함하였다. 연구 결과는 소비자의 유제품 선호도와 칼로리 포함 양 간의 양의 상관관계를 그리고 가격, 지방 함유량과는 음의 상관관계를 보였다. 브랜드를 결정하는데 있어 가장 두드러지게 나타나는 개인 특성은 성별, 나이, 아동과의 동거 유무, 교육 수준, 소득, 우유 구매 빈도 그리고 거주 지역으로 나타난다. 5 가지 브랜드에 대한 선호도를 순서대로 나열하면 Foremost, Nabong, Thai-Danish, Meiji 그리고 Lao-Korea 순으로 나타났으며 각 브랜드별 구매 가능성은 위 브랜드 순서별로 30.9%, 21.48%, 17.48%, 15.0% 그리고 10.39%로 나타났다. 게다가, 국가적 브랜드에 초점을 두고 고품질의 우유를 생산하되 여성, 아동과 함께 거주하며 젊은 세대의 소비자를 대상으로 비엔티엔 중심으로 축산 및 낙농 산업 진흥 정책을 펼친다면 보다 효과적일 것이라 예측해볼 수 있다.

ບົດຄັດຫຍໍ້

ບົດ ຄົ້ນ ຄວ້າ ສະ ບັບ ນີ້ ໄດ້ ເກີດ ຂຶ້ນ ໂດຍ ການ ເຮັດ ບົດ ສອບ ຖາມ ຈໍາ ນວນ 1,165 ຄົ້ງ ກ່ຽວ ກັບ ການ ການ ບໍ ລິ ໂພກ ຜະ ລິດ ຕະ ພັນ ນົມ ຢູ່ ປະ ເທດ ລາວ. ຜົນ ຂອງ ການ ສໍາ ຫຼວດ ໄດ້ ຊີ້ ໃຫ້ ເຫັນ ວ່າ ທັງ ຄຸນ ລັກ ສະ ນະ ຂອງ ຜະ ລິດ ຕະ ພັນ ແລະ ຄຸນ ລັກ ສະ ນະ ຂອງ ລາຍ ບຸກ ຄົນ ເປັນ ຕົວ ກໍາ ນົດ ການ ເລືອກ ບໍ ລິ ໂພກ ຜະ ລິດ ຕະ ພັນ ນົມ ແລະ ໄດ້ ປຽບ ທຽບ ຜະ ລິດ ຈະ ພັນ ນົມ ຈໍາ ນວນ 4 ຍີ ຫໍ້ ກັບ ອີກ ຫນຶ່ງ ຜະ ລິດ ຕະ ພັນ ສົ້ມ ມຸດ ເຊິ່ງ ໃຫ້ ຊື່ ວ່າ ນົມ ລາວ - ເກົ່າ ຫຼື ເຊິ່ງ ບໍ່ ເຄີ ຖ ືກ ຈໍາ ຫນ່າຍ ໃນ ທ້ອງ ຕະ ຫຼາດ ເຊິ່ງ ສົ້ມ ມຸດ ຂຶ້ນ ມາ ຈາກ ອິດ ທ ພົນ ໄດ້ ເນື້ອງ ມາ ຈາກ ການ ຮ່ວມ ມ ຂືອງ ສອງ ປະ ເທດ. ນອກ ຈາກ ນັ້ນ, ນົມ ນ ບົ່ງ ເຊິ່ງ ເປັນ ຜະ ລິດ ຕະ ພັນ ຂອງ ລາວ ກໍ ຖ ືກ ພັນ ຈຸ ເຂ ົ້າ ໃນ ບົດ ສໍາ ຫຼວດ ເພື່ອ ສຶກ ສາ ຄວາມ ເຂ ົ້າ ໃຈ ໃນ ເລືອງ ຄວາມ ສໍາ ນຶກ ຂອງ ຜູ່ ບໍ ລິ ໂພກ ເຖິງ ແມ່ນ ວ່າ ຜະ ລິດ ຕະ ພັນ ດ ັ້ງ ກ່າວ ໄດ້ ຢຸດ ຫນ່າຍ ໃນ ທ້ອງ ຕະ ຫຼາດ ແລ້ວ ກໍ ຕາມ. ຜົນ ຂອງ ການ ສໍາ ຫຼວດ ພົບ ວ່າ ປະ ລິ ມານ ເຄ ລ ື່ ອ ນ ຄ ິ ວ າ ມ ສໍ າ ພ ັ ນ ທ າ ງ ບ ວ ກ ກ ັ ບ ກ ານ ເ ລ ື ອ ກ ບ ໍ ລ ິ ພ ກ ເ ຊ ິ ່ ງ ກ ົ ງ ກ ັ ນ ຂ ້ າ ມ ກ ັ ບ ລ າ ຄ າ ແ ລ ະ ໄ ຂ ມ ັ ນ ຫ ື ມ ີ ຜ ົ ນ ທ າ ງ ລ ົ ບ ກ ັ ບ ກ ານ ເ ລ ື ອ ກ ບ ໍ ລ ິ ໂ ພ ກ . ກ ານ ຕ ັ ດ ສ ິ ນ ໃ ຈ ເ ລ ື ອ ກ ຜ ະ ລ ິ ດ ຕ ະ ພ ັ ນ ແ ມ ່ ນ ມ ີ ຜ ົ ນ ມ າ ຈ າ ກ ເ ງ ື ອ ນ ໄ ຂ ທ າ ງ ດ ້ ານ ຄ ຸ ນ ລ ັ ກ ສ ະ ນ ะ ข อ ง ผ ู ่ บ ่ อ ล ิ โ พ ก เ ช ่ น : เ ผ ด , อ า ย ุ , ค ิ น ห ื อ อ า ไ ส ร ่ อ ม ก ั บ เ ด ็ ก น ้ อ ย , ล ะ ด ั บ ก า น ส ึ ก ส า , ล า ย ร ั บ , ค ว า ม ถ ึ ง ใ น ก า น เ ล ื อ ก ซ ื ้ อ ผ ะ ล ิ ด ต ะ พ ั น น ม ต ่ อ ย า ท ่ ี ่ แ ล ะ เ ง ื อ น ไ ข ท า ง ด ้ า น ผ ู ม ม ี พ า ก ข อ ง ก า น ด ่ า ล ง ช ิ อ ิ ด . ค ว า ม ต ้ อ ง ก า น ใ น ก า น บ ่ อ ล ิ โ พ ก น ม

ແມ່ນ ສະ ແດງ ອອກ ຜ່ານ ຜະ ລິດ ຕະ ພັນ 5 ຢ ຫ້ ເລ ີ ນ : ນ ົ ມ ໂຟ ໂມດ, ນ ົ ມ ນາ ບ ົ ງ, ນ ົ ມ ໄທ ເດ ັ ນ ມ າ ກ, ນ ົ ມ ເມ ຈ ິ ແລ ະ ນ ົ ມ ລ າ ວ - ເກ ົ ່ າ ຫ ຼ ິ ແລ ະ ຄ ວ າ ມ ເປ ັ ນ ໄປ ໄ ດ ้ ທ ີ ຈ ະ ຊ ື ້ ສ ິ ນ ค ้ า ແຕ ่ ລ ะ ຊ ຸ ະ ນ ິ ດ ຄ ິ ດ ໄ ລ ่ ເ ປ ັ ນ 30.9 %, 17.48 %, 21.48 %, 15.0 % ແລ ະ 10.39 % ຕ າ ມ ລ ำ ດ ັ ບ. ນ ອ ກ ຈ າ ກ ນ ั ้ น, ນ ะ ໂ ຍ ບ า ย ก ่ ง อ ก ั บ ส ื ่ ง เ ส ิ ม ก า น ล ้ ง ส ั ด แ ล ะ อ ุ ด ส ะ ห ะ ก ำ น ์ ม ใ น ล า ว จ ะ ไ ด ้ ร ั บ ผ ล ิ ต ภ ั ณ ฑ ์ ด ี ก อ ่ า น ี ้ ถ ้ า ห า ก ม ค ี ว า ม เ อ ำ ใ จ ใ ส ่ ต ื ม ท า ง ด ้ า น ก า น ส ้ า ง แ บ ร น ส ิ น ค ้ า ข อ ง ล า ว เ อ ง, ผ ู ่ บ ่ อ ิ ท ธ ิ พ ล ย ่ ง แ ล ะ ค อ บ ค ็ อ ท ี ม ี ด ั ก น ้ อ ย, น ม ค ุ ะ ภ า พ ส ู ง, ค ่ น ร ุ ่ น ใ ห ม ่ แ ล ะ ข อ บ เ ข ต พ ื ้ น ท ี ่ ะ ค อ น ข ้ อ ง จ ั น.

ค ำ ส ั บ ท ี ่ ส ำ ค ั ญ : ป ะ เ ท ด ล า ว, ค ว า ม ต ้ อ ง ก า น ข อ ง ผ ู ่ บ ่ อ ิ ท ธ ิ พ ล, ส ิ น ค ้ า ส ม ม ุ ด, แ บ บ จ ำ ล อ ง โ ล จ ิ ด.

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