CONSUMER WILLINGNESS TO PAY FOR CHAIYA ORGANIC SALTED EGG IN SMART LABEL PACKAGING: THE CASE STUDY IN SURAT THANI PROVINCE

Kanokphorn THONGKHAM, Praewwanit MEEPIANC, Parichat SUKKHA, Papichaya BUNMARK, Phatcharaphon NARANRAM, Rapee PHONGPHARNICH [ID] [✉]

Department of Economics, Faculty of Liberal Arts and Management Sciences, Prince of Songkla University, Surat Thani Campus, Thailand

Abstract. *Purpose* – This research studies the factors influencing willingness to pay and to evaluate the value of willingness to pay for Chaiya organic salted egg in smart label packaging among consumers in Surat Thani province.

Research methodology – The Conjoint Analysis method was used to analyse attribute factors based on literature reviews and related research. Data were collected through interviews and questionnaires from a consumer group aged 15 years and up, totalling 250 individuals.

Findings – The results revealed that the attribute of the product with the greatest impact on consumer satisfaction is the certification seal for organic authenticity. This attribute would lead to an increasing price of approximately 1.35 USD per box. If Chaiya organic salted egg have modern packaging with a color bar indicating the salt level and an organic certification seal, the price level of Chaiya organic salted egg was two times higher than general Chaiya organic salted egg. Consumers were willing to pay the highest price at 7.46 USD per box.

Research limitations – Having an excessive number of attribute sets may lead to confusion for interviewees when assigning scores to each set of attributes.

Practical implications – Conjoint Analysis is a tool suitable for measuring customer satisfaction towards various product attributes and developing new products to introduce into the market.

Originality/Value – the attribute of the product with the greatest impact on consumer satisfaction is the certification seal for organic authenticity.

1. Introduction

Thailand's total egg-laying duck population is increasing every year throughout the entire country. According to statistics from the Department of Livestock Development in Thailand, the combined nationwide population of egg-laying ducks was 15,716,856 in the year 2020. In the year 2021, there is the number increased to a total of 16,707,649 ducks, and in year 2022, it further rose to 17,570,221 ducks. The province of Surat Thani has a significant contribution to the egg-laying duck farming industry, ranking as the third-highest within the Southern region of Thailand. In 2020, the egg-laying duck population in Surat Thani was 280,609 ducks, in 2021 it was 293,349 ducks, and in 2022, it was 280,338 ducks. It's observed that a single duck

can produce around 250–280 eggs per year. Farmers in Surat Thani province use a portion of these duck eggs to make Chaiya organic salted egg, which they sell to locals and people from other areas. These eggs are then utilized to make a variety of cuisines. When looking back at the history of making Chaiya salted egg in the past, it is found that in 1923, before World War II, Cantonese Chinese immigrants came to Chaiya District, Surat Thani Province, and embarked on developing and producing Chaiya salted eggs. They devised a method to preserve duck eggs, aiming for long-term storage. These immigrants utilized a blend of termite mound soil and fine salt to coat fresh duck eggs, augmenting the mixture with rice husk ashes. This resulted in Chaiya salted eggs characterized by glossy yolk and a delightful aroma and flavour, ultimately making them the most renowned variety in Thailand (Ministry of Agriculture, 2022).

The reputation and quality of Chaiya organic salted egg are evidenced by the province's Industrial Council and the Provincial Chamber of Commerce by selecting Chaiya salted eggs as the province's distinguished product. Moreover, the committee of the "One Tambon One Product" project in Surat Thani province selected Chaiya salted egg as one of the top 10 outstanding products. There are several stores selling Chaiya organic salted egg in Surat Thani province for consumers. However, most of them use the same type of packaging, which consists of rectangular paper boxes. The number of eggs in each pack varies depending on the box size. The boxes are closed by tying the edges with straw ropes for easy handling and stacking in front of the store. This type of packaging is low-cost. On the front of the box, there is a label indicating the name of the store and the date when the eggs can be used to prepare food. The packaging style of each store is not much different, making it not attract interest when selling (Surat Thani Provincial Agriculture Office, 2022).

Currently, the selling price is set at 3.31 USD per box for 12 salted eggs. The typical packaging box for Chaiya organic salted egg has a drawback: it can't communicate useful information to consumers. Chaiya organic salted egg have developed their packaging based on the research project "Design directions for Chaiya salted egg packaging: A case study of the community enterprise group of Chaiya salted eggs volunteer public health of Lemut Sub-district, Chaiya District, Surat Thani Province". By packaging design is a rectangular box with a handle. The salted egg package has a handle that can be placed on a shelf and stacked without having to fold or damage any part of it, thus preserving its aesthetic appeal. The new packaging style can create higher value than the old style, with the selling price set at 4.14 USD per box for 12 salted eggs. It can be seen that this type of packaging still has a disadvantage: it is not yet able to communicate useful information to consumers accurately and precisely (Ministry of Commerce, 2022). From the aforementioned information, we have identified a problem with the packaging of Chaiya organic salted egg, which is the inability to communicate useful information to consumers. Specifically, the correct and accurate consumption dates for both fried and boiled eggs are lacking. The researchers have sought information and found that smart label packaging can solve this problem by using a color-changing mechanism on the smart label, a method already used in other types of products. Intelligent packaging is a subset of "Smart Packaging" designed to enhance reliability beyond simply displaying expiration dates on the packaging. It allows for monitoring shelf life and can transmit this information to consumers. The primary goal of smart packaging is to improve

product quality, add value, or enhance convenience. Intelligent packaging can be categorized into three main groups: sensors, indicators, and data carriers (Du et al., 2023).

This has been adapted for use with Chaiya salted eggs. The smart label used will react with the moisture released from the egg as salt replaces the water in the egg, causing the color band to change levels. This indicates the level of salinity suitable for frying (yellow) to the level of salinity suitable for boiling (red). This allows consumers to know the appropriate salinity level of Chaiya organic salted egg for frying or boiling and is one way to add value to Chaiya organic salted egg. There are various indicators used in different types, which signify excellent opportunities for development. For instance, Time-Temperature Indicators (TTIs) are widely used indicators that can be categorized into biologically based, physicochemical, chemical, enzyme-based, diffusion-based, and polymer-based. This research aims to advance and link scientific research to the creation of products or value additions to existing products in the market. This is achieved through the design and collection of data within the framework of social science research by utilizing economic tools to help explain consumer behavior regarding their willingness to pay. This is consistent with the research on consumers in Malaysia's Central and Southern regions have a growing preference for organic eggs, with a willingness to pay more for specific attributes. The key determinant is price, emphasizing the importance of affordable, larger brown organic eggs with eco-friendly packaging for egg producers to meet changing consumer demands. This study provides important insights into product development and marketing strategies in Malaysia's egg market (Idrus et al., 2023). In addition, there is also research on the willingness to pay for organic cavendish bananas in smart packaging among Thai consumers in Chiang Mai province. The research found that if the smart packaging has an organic farming certification, a label indicating benefits, a color strip indicating the ripeness level, and the price is twice that of regular bananas, consumers in Chiang Mai are most willing to pay, and if the smart label has an organic farming certification but does not have a benefit indication label, no color strip indicating the level of ripeness, and the price is four times that of regular bananas (Nantasen & Nantasen, 2020).

The research team is extremely interested in studying the willingness to pay for Chaiya salted eggs in smart packaging by consumers which has benefits to the salted egg business operators in Surat Thani province. The researchers will study the factors affecting the willingness to pay for Chaiya organic salted egg in smart packaging and evaluate the value of the willingness to pay for these eggs in smart packaging. Then, the research team will use the data from this research as a guideline for conducting business, to enhance competitive capabilities and the pricing of products. Furthermore, this can serve as a guideline for new business operators interested in investing in this type of business.

2. Literature review

Utility refers to the satisfaction that occurs with consumers when they receive, consume, or benefit from a product or service. Generally, products or services have inherent benefits or harms, which come in the form of their ability to meet human needs such as satisfaction, convenience, health benefits, stability in livelihood, etc. The level of satisfaction of each consumer will depend on factors such as personal preferences, necessities, thoughts, understanding

of economic and social conditions, and demographic factors (Tiep et al., 2021). Therefore, in order to compare the satisfaction or utility of two consumers towards the same product, it could vary depending on the surrounding factors at the time for each consumer.

2.1. Conjoint Analysis approach

Consumer satisfaction studies encompass a range of quantitative topics such as buying behavior, factors influencing purchasing decisions, issues in purchasing, and the general needs of consumers towards products. These studies often involve considerations around product attributes, for instance, exploring the relationship between product characteristics and the price consumers are willing to pay, a concept known as hedonic pricing. By using the concept of finding the highest satisfaction of consumers who have consumed various quality products under budget or income limitations of consumers. By analyzing the price of goods Consumers are willing to pay for the attributes of a particular product. Studying the quality factors that exist price influence the quality variables that have been studied are the causes of high or low prices, such as size, shape, color, maturity, etc. The issue of interest in satisfaction with various product attributes, in addition to the hedonic price method, has also been studied. conduct a study on product characteristics by studying the satisfaction of consumers with different characteristics of the product, the method used is called Conjoint Analysis (CA).

Conjoint Analysis (CA) is a marketing tool used to measure consumer satisfaction among diverse feature choices and also serves as a tool for measuring physical decision-making (such as consumer satisfaction) or perceptions of similar or different options. The key point of Conjoint Analysis is to explain the features consumers desire in products and services. Conjoint Analysis will be utilized to estimate satisfaction in the selection of product and service attributes to understand consumer satisfaction with product and service features, such as applying Conjoint Analysis in the study of products like food, cars, computer software, soap, toothpaste, credit cards, health care systems, tourism, etc. Conjoint Analysis studies enable an understanding of satisfaction in diverse features and can be used as data to improve products and services to meet consumer needs. The Conjoint Analysis study has several steps, each of which depends on the individual researcher to determine the details in each step. The Conjoint Analysis study steps proposed by Guevarra et al. (2023) and Wang et al. (2022), which are the clearest method to apply in this study, consisting of 6 steps as follows.

The first step is to select the attributes and levels of attributes used in the study. A careful and appropriate selection of attributes is required. The selected attributes should address the issue and cover all the attributes used in decision-making. It is up to the researcher to determine the number of attributes that cover the entire study and they must be real attributes in the products and services.

The second step is to construct attribute sets. All attributes used in the study are derived by multiplying all the levels of attributes used in the study. For instance, if there are overall attributes used in the study (2 × 2 × 2 × 3), it means there are 24 attribute sets. It is possible to reduce the entire possible attribute sets by employing the Full Fractional Factorial Design method to get appropriate attribute sets for use in the study, and it's feasible for the sample consumers to answer the questions.

The third step selects the design for collecting data (full profile design). This method presents a set of options for all different factor levels for consumers to rate their satisfaction. By displaying a set of options at various factor levels, which is a card with text describing the factors that express the level of characteristics and images to help consumers understand the set of options, it helps attract attention when answering questions.

The fourth step involves measuring satisfaction, which can be assessed in two ways. One method is to give a satisfaction rating, a metric measure that involves scoring from 1–10 or 1–100. This allows for an understanding of how much respondents' satisfaction varies and by how much. The other method is ranking the importance, a non-metric measure that allows for understanding the order of consumers' satisfaction with each type of product, but it does not reveal how much the satisfaction differs.

The fifth step involves choosing a suitable satisfaction model, or specification of a model of preference, for the study. The commonly used preference models generally include: 1. The discrete model is a simple way to estimate the utility model. It's suitable for variables that have characteristics where it's impossible to determine whether a change in the level of those characteristics will result in an increase or decrease in satisfaction. 2. The vector model demonstrates the relationship between satisfaction and attribute levels as a single linear function. It's suitable for characteristics where changes result in linear increases or decreases. For instance, price-related characteristics could fit this model, where the utility of a product decreases proportionately as the price increases. (Dong & Jiang, 2022).

The sixth step involves selecting a method to estimate the satisfaction of attribute levels. For metric satisfaction measurements, the ordinary least squares (OLS) method is used to estimate the satisfaction value for the product's characteristics. For non-metric satisfaction measurements, the MONANOVA or LiNMAP methods are utilized. However, if measuring satisfaction using a choice-probability approach, regression analysis methods such as the logit model or probit model are used. For traditional conjoint analysis studies, pre-packaged software like SPSS can be used to estimate the satisfaction value for the product's attributes, whether it's measured in metric or non-metric form.

Additionally, Conjoint Analysis studies can examine consumers' willingness to pay (WTP) when product characteristics change. This can be calculated by determining the value of the consumers' willingness to pay when the product attribute levels change, according to the ideas of K. Nantasen and W. Nantasen. The calculated WTP, which can be calculated following the estimation by Conjoint Analysis, allows us to understand how changes in product attributes would influence how much consumers are willing to pay for those specific attribute changes (Nantasen & Nantasen, 2020).

2.2. Willingness to pay (WTP)

Willingness to Pay (WTP) describes the desire to purchase a certain product or service at various price levels, to satisfy needs at a certain point in time. How much consumers are willing or ready to pay for the product or service depends on their awareness of its value. Each unit of the product or service is perceived to provide a certain utility or satisfaction. At the same time, consumers themselves have a limit to their ability to pay for the desired quantity

of the product or service. In other words, the willingness to pay reflects the law of demand, which discusses the quantity of a certain product or service that consumers wish to purchase within a time period at various price levels. The key factors influencing changes in demand for a particular product or service include the consumer's income level, the price of other complementary or substitute products, the consumer's tastes, the number of consumers, and future price expectations (Brago et al., 2022).

2.3. Related research

2.3.1. Conjoint analysis (CA)

Conjoint analysis is a market research technique that is used to analyze and quantify how consumers make decisions when they are presented with numerous aspects or features of a product or service. The study conducted by Speight et al. (2019) identified the important factors affecting the purchase of prepackaged Cheddar cheese shreds. The most significant features for customers were determined to be price, nutrition claims, color, sharpness, thickness, and label claims. Consumers were classified into clusters based on their preferences for value-added features, shred color, price, and a qualitative study supported. The relevance of meltability, orange color, lack of clumps, resealable package, and pleasant flavor. When it concerns prepackaged Cheddar cheese shreds, consumers prioritize price, but a specific group is willing to pay more for better flavor and nutrition. This study examined the preferences of Italian consumers for Provolone Valpadana cheese by using conjoint analysis. The study revealed that, among all consumer groupings, brand was the most favored property. Price, EU quality certification, organic manufacturing, and lactose-free labeling were the next most popular attributes.

Mongi and Gomezulu (2022) study aimed to assess beef sausages with varying levels of pigeon pea protein (2%, 4%, and 6% w/w) as binders, along with control sausages without binders and phosphate binder sausages. Trained panelists used QDA to evaluate sensory attributes, while consumers participated in a hedonic test. Preference mapping and conjoint analysis were employed to link sensory and consumer data. The 6% pea protein sausages showed improved sensory attributes compared to phosphate sausages, except for moistness. Consumer preference was highest for phosphate sausages, followed by 6% pea protein sausages, with specific sensory attributes influencing acceptability. Pea protein holds promise as a viable alternative in the food industry. Further research is required to determine the optimal pea protein content that can outperform phosphate binders and enhance overall sausage quality.

2.3.2. Willingness to pay (WTP)

Willingness to Pay (WTP) is a concept used in economics and market research to calculate the maximum amount of money that an individual or group of individuals is willing to spend or allocate in order to acquire a product, service, or special attribute. It indicates a consumer's perceived worth or utility of a certain item or feature. Herrmann et al. (2022) conducted a study about consumer perception of sustainability and their willingness to pay for alternative food packaging. The tool used in this study was a questionnaire, from a total sample group of 254 people. Data were analyzed using the willingness to pay (WTP) approach, with

the following related factors: production characteristics (conventional, organic), geographical characteristics (global, regional), packaging characteristics (recyclable plastic, bioplastic, paper, no packaging), and price levels (1.08, 1.55, 2.04, 2.52, 2.99). The study found that consumers are willing to pay for packaging it is environmentally friendly and they are unwilling to pay for packaging that is not environmentally friendly.

Schott et al. (2022) conducted a study on the willingness to pay for region-specific labeling of chocolate bars. The research was carried out using a questionnaire with a sample group comprising 165 participants from developed economies (USA and Europe) and developing economies (Africa and South America). The data was analyzed using the Willingness to Pay (WTP) theory, and the relevant factors considered were perceptions of food safety and quality, average taste preferences for labeled and regional chocolates, and willingness to pay according to labels and regions. The study revealed significant improvements in the quality of food safety and economic development in the developed regions. Participants in the developed and developing regions showed a stronger liking for labeled chocolates and were willing to pay more for chocolates compared to non-labeled ones.

Liu et al. (2023) investigates consumer preferences and willingness to pay for eco-labeled eggs. The study reveals important insights by employing conditional logistic and mixed logistic models. It emphasizes that factors such as higher income, families with pregnant women or children, and a strong trust in and knowledge of eco-labels all have a positive impact on the choice of eco-label eggs. Certification labels, free-range husbandry, and nutrition enrichment all help to increase consumer preference. According to the findings, consumers are willing to pay a significant price premium of 375.0% for eggs labeled organic, free-range husbandry, and nutrition enrichment, demonstrating the importance of such attributes. This groundbreaking study sheds light on consumer attitudes toward eco-labeled eggs.

2.3.3. Conjoint Analysis (CA) and willingness to pay (WTP)

Conjoint Analysis (CA) and Willingness to Pay (WTP) are frequently used together to acquire a thorough insight into consumer preferences and pricing strategies. When combined, they can provide valuable information for product development, pricing, and marketing decision-making. Alsubhi et al. (2022) use conjoint analysis and the willingness to pay approach highlights the importance of consumer willingness to pay for healthier food products in the success of food retail strategies aimed at improving dietary choices. Based on 15 studies and 26 experiments, the findings show that a sizable majority of consumers are willing to pay a significant price premium, ranging from 5.6% to 91.5%, for healthier food options. Notably, consumers prefer foods with low fat and whole grains, supplemented with fruits and vegetables, while responses to foods with low salt or a combination of low fat and low sugar content vary. Age, gender, weight status, and lifestyle choices all have a significant impact on willingness to pay. This study provides valuable insights for retailers by emphasizing the advantages of providing healthier food.

Brückner et al. (2023) explore how emotions influence decisions about food, with a particular focus on yogurt preferences in Germany. The study reveals that when making decisions about yogurt, consumers give priority to factors like ingredients, price, flavor, nutri-score, and production methods. The results point to three distinct emotional clusters among consumers:

an indifferent cluster that values affordability over other qualities; a positive cluster that values ecological and health aspects and is willing to pay more; and a rather positive cluster with similar preferences but varying willingness to pay. The findings provide significant perspectives for food marketing and health interventions, indicating that eliciting emotions can improve consumers' shopping experiences and product selections.

Chiou et al. (2023) study is the first to use conjoint analysis to evaluate multi-feature agricultural goods baskets. It provides useful insights into consumer preferences by evaluating a variety of attributes, such as organic, animal welfare-based, and natural products without additives. According to the findings, consumers are willing to pay a variety of price premiums for these features, with natural products commanding the highest premium, followed by organic and animal welfare-based options. The study's novel approach emphasizes the importance of taking into account multiple features when determining consumer willingness to pay to avoid potential overestimation.

Idrus et al. (2023) investigate the preferences of Malaysian consumers in the Central and Southern regions regarding the characteristics of eggs and their propensity to purchase organic eggs. Using the conjoint analysis and willingness to pay approach, it shows that consumers are shifting toward organic eggs and are willing to pay extra for certain features like brown color, larger size (size A), organic production, and environmentally friendly packaging. The most important factor influencing consumer decisions turned out to be price. These results offer insightful information to egg farmers, indicating that in order to meet consumer demand, they should concentrate on producing larger, more reasonably priced brown organic eggs in environmentally friendly packaging. This study adds to our knowledge of how consumer preferences are evolving in Malaysia's egg market and provides direction for future product development and advertising tactics.

3. Research methodology

3.1. Population and sample group

The research population consists of consumers residing in Surat Thani province, with a total of 1,056,292 individuals (Ministry of Interior, 2021). The sample group consists of consumers aged 15 years and above, totaling 856,226 individuals (Ministry of Interior, 2021). This group comprises consumers who have the ability to make decisions and select products for personal consumption. The sample size was determined using the table provided by Krejcie and Morgan (1970, pp. 607–610), with a margin of error not exceeding 5% ($\alpha = 0.05$). Therefore, for this study, 250 consumers who purchase Chaiya organic salted egg in non-specific packaging in Surat Thani province were selected as the sample group. Data were collected using online questionnaires and interviews.

3.2. Research tools

In this study, a questionnaire was designed, and the number of possible attribute combinations was set to $2 \times 2 \times 2 \times 3 = 24$ combinations. However, it was found that there were a large number of options, making it challenging to create a questionnaire due to some options

lacking relationships and possibly conflicting with each other. Additionally, some options might not be feasible. Therefore, to obtain a suitable number of attribute combinations for the study and ensure that consumers can answer the questions, the viable attribute combinations were selected using the SPSS software. This process aimed to generate sets of concept cards with orthogonal factors, using the Orthogonal Design analysis command to reduce the number of attribute combinations. This resulted in a set of suitable attribute combinations, but the final selection required the researchers' judgment to analyze the meaningfulness of the options and eliminate any unfeasible choices, as shown in Table 1.

Table 1. Optional attribute sets (source: researcher's calculations)

Optional sets	Packaging	The color bar indicates the salinity level.	Organic certification	Price level (Times)
1.	General packaging	no color bar	Certification	3
2.	General packaging	color bar	No certification	4
3.	General packaging	color bar	Certification	2
4.	Modern design packaging	color bar	No certification	3
5.	Modern design packaging	no color bar	No certification	2
6.	Modern design packaging	no color bar	Certification	4
7.	Modern design packaging	color bar	Certification	2
8.	General packaging	no color bar	No certification	2

3.3. Data collection

In order to achieve the objectives of this research, data must be collected as follows: Primary Data: This refers to data obtained through the collection of questionnaires from consumers who have previously consumed Chaiya organic salted egg in Surat Thani province. The sample size is 250 respondents, and the data collection process involves the following steps: Secondary Data: This includes data obtained through literature review and data collection from both government and private sources. It encompasses internet-based information related to Chaiya organic salted egg, academic publications, and relevant research reports.

3.4. Data analysis

Analysis of Satisfaction Level for Each Attribute: Data analysis was conducted in Part 2 of the survey, which pertained to product attributes and attribute levels. The statistical software SPSS was employed to analyze consumer satisfaction levels towards Chaiya organic salted egg in smart-label packaging using the following technique:

Conjoint Analysis, a technique used to analyze the preferences and inclinations of the sample group, was employed in this study. The analysis was conducted using a command syntax consisting of

1. Important attributes that influence satisfaction or purchase decisions.
2. Consumer satisfaction towards the attributes of Chaiya organic salted egg in smart-label packaging.

3. Total utility and ranking of Chaiya organic salted egg in smart-label packaging for each attribute combination, demonstrating the mathematical formula for the total utility of Chaiya organic salted egg in smart-label packaging as follows:

$$
\begin{aligned}
Y = \beta_0 + \beta_1 Pack_x + \beta_2 Pack_y + \beta_3 Label_x + \beta_4 Label_y + \\
\beta_5 Cert_x + \beta_6 Cert_y + \beta_7 Price_x + \beta_8 Price_y + \beta_9 Price_z,
\end{aligned} \tag{1}
$$

where Y represents the total utility which is applied as the willingness to pay for smart-labeled organic salted eggs by consumers in Surat Thani province; $Pack_x$ refers to the regular packaging; $Pack_y$ refers to the modern-designed packaging; $Label_x$ indicates the presence of color-coded saltiness levels; $Label_y$ indicates the absence of color-coded saltiness levels; $Cert_x$ indicates the presence of organic certification; $Cert_y$ indicates the absence of organic certification; $Price_x$ represents the price level of organic salted eggs higher than the regular ones by 2 times; $Price_y$ represents the price level of organic salted eggs higher than the regular ones by 3 times; $Price_z$ represents the price level of organic salted eggs higher than the regular ones by 4 times.

Consumer Willingness to Pay Analysis: Taking the satisfaction values towards the studied attributes and the price coefficient, which is the result of the conjoint analysis, the willingness to pay (WTP) for Chaiya organic salted egg in smart-label packaging can be calculated using the equations proposed by van der Pol and Ryan (1996) and Roe et al. (1996).

$$
WTP = \frac{Coefficient\ of\ Attribute}{Coefficient\ of\ Price}. \tag{2}
$$

WTP provides information on how much consumers are willing to pay for changes in product attributes. It reveals the level of satisfaction and the monetary value consumers associate with each attribute change.

4. Results and discussion

The study on the factors of product attributes and the evaluation of consumers' willingness to pay for Chaiya organic salted egg in smart-label packaging yielded the results as follows.

The general data analysis of survey respondents in this research includes demographic characteristics such as gender, age, educational level, occupation, and average monthly income. The survey was completed by a total of 250 participants, which can be discussed as follows:

The sample predominantly consisted of female participants, comprising 68 percent of the total, while males made up the remaining 32 percent. The most common age group within the sample fell within the 46–50 years range, accounting for 30 percent, followed by individuals aged 36–40 years at 13.2 percent. The 26–30 years age range represented 9.6 percent, and those aged 21–25 years constituted 10.4 percent. Additionally, the age groups of 51–55 years, 41–45 years, and over 60 years made up 7.2 percent, 6.8 percent, and 6.4 percent, respectively. The age range of 56–60 years accounted for 6 percent, while individuals aged 15–20 years and 31–35 years represented 5.6 percent and 4.8 percent, respectively. Regarding educational attainment, the majority of the sample had some form of education. A significant portion held

a bachelor's degree, making up 53.6 percent. The next largest group had either a high school diploma or vocational certificate, constituting 20.4 percent. Primary school education was the level of 8.4 percent, and those with an associate degree or vocational certificate accounted for 7.6 percent. Lower secondary school education represented 5.6 percent, and individuals with a postgraduate level of education were at 4.4 percent.

The sample group's primary occupational category is within the public sector, comprising 30.4 percent of the respondents, with 76 individuals. General laborers make up the second-largest group, totalling 45 individuals, accounting for 18 percent. Private sector employees represent 12.4 percent, with 31 individuals. Students account for 12 percent of the sample, with 30 individuals, while 24 individuals are salespeople, making up 9.6 percent. Farmers constitute 5.6 percent, with 14 individuals, and self-employed individuals represent 6.8 percent, totaling 17 individuals. Homemakers account for 4.8 percent, with 12 individuals, and there is one unemployed individual, making up 0.4 percent of the sample group. Regarding monthly income, the majority of the respondents fall within the income range of 735.32 to 1,029.41 USD, accounting for 54.8 percent, with 137 individuals. The next most significant income group falls within the 441.18 to 735.29 USD, comprising 22.4 percent, with 56 individuals. Those earning less than 441.18 USD per month represent 12 percent, with 30 individuals, while 16 individuals earn more than 1,470.59 USD, accounting for 6.4 percent. Finally, 11 individuals fall within the 1,029.41 to 1,470.59 USD income range, making up 4.4 percent of the sample group (The exchange rate is 34 Baht: 1 USD, 15 May 2023).

The results of the Conjoint Analysis revealed the following product attributes that influence the purchasing decisions of Chaiya organic salted egg in smart-label packaging:

- Packaging Attributes:
  - Regular Packaging: Refers to the current packaging used for Chaiya organic salted egg.
  - Modern Design Packaging: Refers to packaging designed to accommodate salt-level color bands.
- Salt-Level Color Band Attributes:
  - With Salt-Level Color Band: Refers to the presence of a color band that indicates the salt level when moisture is released from the egg as a result of salt absorption. The color band changes to signify the level of salinity, ranging from levels suitable for frying (yellow) to levels suitable for boiling (red).
  - Without Salt-Level Color Band: Refers to the absence of a color band that indicates the salt level when moisture is released from the egg as a result of salt absorption. There is no color change to signify the salt level, and it does not provide an indication of different salinity levels for frying (yellow) or boiling (red).
- Organic Certification Attributes:
  - With Organic Certification: Refers to products that have been certified as meeting the organic product standards of Thailand (Organic Thailand) or other organic certifications displayed on the product.
  - Without Organic Certification: Refers to products that do not have certification indicating compliance with the organic product standards of Thailand (Organic Thailand) or other organic certifications displayed on the product.
- Price Level Attributes:
  - The price level of Chaiya organic salted egg is higher than the regular Chaiya organic salted egg by 2 times.

- ◆ The price level of Chaiya organic salted egg is higher than the regular Chaiya organic salted egg by 3 times.
- ◆ The price level of Chaiya organic salted egg is higher than the regular Chaiya organic salted egg by 4 times.

Table 2. Importance values of attributes for Chaiya organic salted egg in smart-label packaging (source: researcher's calculations)

Attribute	Importance values
Packaging	23.507
The color bar indicates the salinity level	21.007
Organic certification	22.310
Price level	33.175

The price attribute is the most important factor to consumers, accounting for 33.175% of importance, is presented in Table 2. This result indicates that price significantly influences the purchasing decision of Chaiya organic salted egg in smart-label packaging among consumers in Surat Thani province.

Results of the analysis on the preferred attributes when consumers make purchasing decisions for Chaiya organic salted egg in smart-label packaging. The analysis results to identify the attributes preferred by consumers when making decisions to purchase smart-labeled organic salted eggs were obtained using the Conjoint Analysis technique. These results, based on the sample group of 250 individuals, are presented in Table 3 and can be expressed in equations as follows:

$$Y = 6.075 - 0.266 Pack_A + 0.266 Pack_B + 0.558 Label_{Yes} - 0.558 Label_{No} + \\ 0.732 Cert_{Yes} - 0.732 Cert_{No} - 0.900 Price_2 - 1.800 Price_3 - 2.699 Price_4, \tag{3}$$

where Y represents the total utility which is applied as the willingness to pay for smart-labeled organic salted eggs by consumers in Surat Thani province; $Pack_A$ refers to the regular packaging; $Pack_B$ refers to the modern-designed packaging; $Label_{Yes}$ indicates the presence of color-coded saltiness levels; $Label_{No}$ indicates the absence of color-coded saltiness levels; $Cert_{Yes}$ indicates the presence of organic certification; $Cert_{No}$ indicates the absence of organic certification; $Price_2$ represents the price level of organic salted eggs higher than the regular ones by 2 times; $Price_3$ represents the price level of organic salted eggs higher than the regular ones by 3 times; $Price_4$ represents the price level of organic salted eggs higher than the regular ones by 4 times.

Based on Table 4, it can be observed that profile card 7 has the highest total utility, which is 6.730. This profile represents the attributes of organic salted eggs in smart label packaging with a modern design, salt level indicator strip, and organic certification, at a price level 2 times higher than regular salted eggs.

On the other hand, profile card 2 has the lowest total Utility, which is 2.935. This profile represents the attributes of organic salted eggs in a smart label packaging with a general design, salt level indicator strip, without organic certification, at a price level 4 times higher than regular salted eggs.

Table 3. Results of consumer preference analysis on desired attributes (source: researcher's calculations)

Attribute	Attribute Level	Preference Level (Utility)	Standard Deviation
Packaging Type	General Packaging	–0.266	0.302
	Modern design packaging	0.266	0.302
Label	There is a color bar indicating the salinity level.	0.558	0.302
	There is no color bar indicating the salinity level.	–0.558	0.302
Organic certification	Certification	0.732	0.302
	No certification	–0.732	0.302
Price level	2 times	–0.900	0.364
	3 times	–1.800	0.728
	4 times	–2.699	1.092
Constant		6.075	0.705

Table 4. Total utility and ranking of alternative attribute sets (source: researcher's calculations)

Alternative set	Packaging	Label	Organic certification	Price level (time)	Total satisfaction level	WTP (USD/box)	Rank
1	general	no color	certification	3	4.183	5.20	4
2	general	color	No certification	4	2.935	0.45	8
3	general	color	certification	2	6.198	6.18	2
4	modern design	color	No certification	3	4.367	5.82	3
5	modern design	no color	No certification	2	4.151	5.14	5
6	modern design	no color	certification	4	3.815	4.80	6
7	modern design	color	certification	2	6.730	7.44	1
8	general	no color	No certification	2	3.619	1.43	7

The results of evaluating the value of consumers' willingness to pay toward attribute.

If the packaging is of modern design, has a salt level indicator, organic certification, and the price of organic salted eggs is 2 times higher than regular salted eggs, consumers in Surat Thani province are willing to pay the highest amount, which is 7.44 USD per box. On the other hand, if the packaging is regular, has a salt level indicator, no organic certification, and the price of organic salted eggs is 4 times higher than regular salted eggs, consumers in Surat Thani province are willing to pay the lowest amount, which is 0.45 USD per box.

5. Conclusions

Results of a study of willingness to pay for Chaiya organic salted egg in smart label packaging of consumers in Surat Thani Province. Based on the research findings, it can be indicated that individuals between the ages of 30 and 50 years with an education level equivalent to a high school diploma or vocational certificate have a medium and high average income. This is a

group that pays attention to and gives importance to colored strip labels indicating the level of salinity. This group of people is very beware of their health and does not want to consume too much sodium from salted eggs as can harm the body. By analyzing the attribute of the conjoint components (Conjoint Analysis) of the product indicated that attribute factors of Chaiya organic salted egg consist of packaging, the salinity band, organic certification and price level attributes, which consistent with the research of (Nantasen & Nantasen, 2020; Idrus et al., 2023), it was found that the price level factor was the most important attribute of consumers in Surat Thani Province. Therefore, the consumption of Chaiya organic salted egg should be promoted more through intelligent label packaging with color bar indicating the level of salinity. Moreover, if consumers show more interest in consuming Chaiya organic salted egg, an increase in the availability of these eggs in the market will lead to a reduction in prices. When prices decrease, consumers will be able to afford and consume more Chaiya organic salted egg. This will have a positive impact on businesses that sell Chaiya organic salted egg.

The factor of organic certification is ranked as the third most important factor for consumers when purchasing Chaiya organic salted egg. Consumers are less satisfied when the eggs do not have organic certification compared to those with organic certification. Therefore, enterprises should instill confidence in consumers that organically-certified Chaiya salted eggs are safe to consume. Additionally, the presence of color-coded labels indicating the salt level is a factor that can significantly increase the likelihood of selling more Chaiya organic salted egg. The results of the analysis on the importance of factors for organic Chaiya salted eggs in smart label packaging are consistent with Kerry Group's research, which found that 9 out of 10 consumers who read labels are willing to pay extra for products with clean food labels. Additionally, the presence of QR codes on products can lead consumers to websites providing crucial information about the product, including potential health hazards, environmental aspects, GMO status, and whether the product is sourced from specific farms or farmers. This information reflects the product's ethical and environmental responsibility, indicating the manufacturer's Corporate Social Responsibility (CSR). It helps create a positive image for this particular product format (Jürkenbeck, 2023).

The evaluation of the willingness to pay as the attribute of Chaiya organic salted egg change, the attributes that have the highest impact on consumer satisfaction are the presence of organic certification will lead to an increase in consumer satisfaction by approximately 1.35 USD per box. The presence of color-coded labels indicating the salt level will lead to an increase in consumer satisfaction by approximately 1.03 USD per box. The use of a modern and stylish packaging design will lead to an increase in consumer satisfaction by approximately 0.49 USD per box. These findings are in line with the concept of willingness to pay, where consumers are willing to pay varying amounts based on their perception of the value and utility they will receive from consuming a particular product or service. The ability of consumers to purchase the product or service will also depend on their financial capacity (Li et al., 2023).

6. Suggestions and limitations

In this study, the findings can be utilized as a guideline for the business operations of Chaiya organic salted egg entrepreneurs and serve as a direction for new entrepreneurs interested in investing in this type of business. In designing the packaging, a modern and innovative

design that can accommodate labeling for salt level and organic certification from government agencies such as the Ministry of Agriculture and Cooperatives should be considered since they oversee this matter. This will enable the production of Chaiya organic salted egg that align with consumers' most important attributes, including setting a suitable price that consumers can afford. Conjoint Analysis is a tool suitable for measuring customer satisfaction towards various product attributes and developing new products to introduce into the market. It is also used for product and service improvement to better align with consumers' preferences and meet their needs most effectively. By utilizing Conjoint Analysis, businesses can understand customer choices and preferences, leading to the creation of products and services that cater to consumers' demands most. Furthermore, those interested in researching packaging and new products derived from agricultural goods should reduce the number of factors or attribute sets to align with consumer preferences. Having an excessive number of attribute sets may lead to confusion for interviewees when assigning scores to each set of attributes.

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References

Alsubhi, M., Blake, M., Nguyen, T., Majmudar, I., Moodie, M., & Ananthapavan, J. (2022). Consumer willingness to pay for healthier food products: A systematic review. *Obesity Reviews*, *24*(1), Article e13525. https://doi.org/10.1111/obr.13525

Brago, P., Danso-Abbeam, G., Ogundeji, A. A., Abankwa, J., Ehiakpor, D. S., Awuni, J. A., & Dagunga, G. (2022). Consumers' willingness to pay for quail products in Tamale metropolis, Ghana. *Journal of Agriculture and Food Research*, *10*, Article 100445. https://doi.org/10.1016/j.jafr.2022.100445

Brückner, K., Emberger-Klein, A., & Menrad, K. (2023). The role of emotions in food-related decision-making: A choice-based conjoint analysis of yogurt preferences. *Journal of Food Products Marketing*, *29*(6), 177–196. https://doi.org/10.1080/10454446.2023.2227575

Chiou, Y., Wu, P., Liou, J., Huang, T., & Chen, C. (2023). what is the willingness to pay for a basket of agricultural goods? Multi-features of organic, animal welfare-based and natural products with no additives. *Agriculture*, *13*(9), Article 1743. https://doi.org/10.3390/agriculture13091743

Dong, X., & Jiang, B. (2022). The market effectiveness of regulatory certification for sustainable food supply: A conjoint analysis approach. *Sustainable Production and Consumption*, *34*, 300–309. https://doi.org/10.1016/j.spc.2022.09.020

Du, H., Sun, X., Chong, X., Yang, M., Zhu, Z., & Wen, Y. (2023). A review on smart active packaging systems for food preservation: Applications and future trends. *Trends in Food Science & Technology*, *141*, Article 104200 https://doi.org/10.1016/j.tifs.2023.104200

Guevarra, A. L. C., Prasetyo, Y. T., Ong, A. K. S., & Mariñas, K. A. (2023). Employees' preference analysis on lean six sigma program coaching attributes using a conjoint analysis approach. *Heliyon*, *9*(7), Article e17846. https://doi.org/10.1016/j.heliyon.2023.e17846

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W. E. Arsawan et al. Invigorating supply chain performance in small medium enterprises: exploring…

Herrmann, C., Rhein, S., & Sträter, K. F. (2022). Consumers' sustainability-related perception of and willing-ness-to-pay for food packaging alternatives. *Resources, Conservation & Recycling*, *181*, Article 106219. https://doi.org/10.1016/j.resconrec.2022.106219

Idrus, S., Nizam, N. Z., Liew, Y. S., Kamarudin, N., & Bakri, M. H. (2023). Consumers' preferences for egg attributes with tendency purchase organic eggs and willingness to pay for the preferences within Central Region and Southern Region of Malaysia. *International Journal of Professional Business Review*, *8*(7), Article e02070. https://doi.org/10.26668/businessreview/2023.v8i7.2070

Jürkenbeck, K. (2023). The effect of information among established and new sustainability labelling on consumers' preference and willingness to pay. *Cleaner and Responsible Consumption*, *10*, Article 100131. https://doi.org/10.1016/j.clrc.2023.100131

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, (30), 607–610. https://doi.org/10.1177/001316447003000308

Li, Y., Yao, Z., & Guo, Z. (2023). Willingness to pay and preferences for rural tourism attributes among urban residents: A discrete choice experiment in China. *Economic Analysis and Policy*, *77*, 460–471. https://doi.org/10.1016/j.eap.2022.11.020

Liu, C., Liu, X., Yao, L., & Liu, J. (2023). Consumer preferences and willingness to pay for eco-labelled eggs: a discrete choice experiment from Chongqing in China. *British Food Journal*, *125*(5), 1683–1697. https://doi.org/10.1108/BFJ-12-2021-1305

Ministry of Agriculture. (2022). Annual report 2022. Department of Livestock Development, Ministry of Agriculture. https://dld.go.th/th/index.php/th/

Ministry of Commerce. (2022). *Annual report 2022.* Department of Internal Trade, Ministry of Commerce. https://agri.dit.go.th/index.php/about_us

Ministry of Interior. (2021) *Population statistics report 2022.* Department of Provincial Administration. https://stat.bora.dopa.go.th/stat/statnew/statMenu/newStat/stat/

Mongi, R. J., & Gomezulu, A. D. (2022). Descriptive sensory analysis, consumer acceptability, and conjoint analysis of beef sausages prepared from a pigeon pea protein binder. *Heliyon*, *8*(9), Article e10703. https://doi.org/10.1016/j.heliyon.2022.e10703

Nantasen, K., & Nantasen, W. (2020). Willingness to pay for organic cavendish banana in intelligent pack-aging: A study of Thai consumers in Chiang Mai Province. *Journal of Humanities and Social Sciences, Thammasat University*, *15*, 70–79.

Roe, B., Boyle, K. J., & Teisl, M. F. (1996). Using conjoint analysis to derive estimates of compensating variation. *Journal of Environmental Economics and Management*, *31*(2),145–159. https://doi.org/10.1006/jeem.1996.0037

Schott, L., Britwum, K., & Bernard, J. C.(2022). Can region labeling alter taste impressions and willingness to pay? A field experiment with chocolate bars. *Food Quality and Preference*, *100*, Article 104606. https://doi.org/10.1016/j.foodqual.2022.104606

Speight, K. C., Schiano, A. N., Harwood, W. S., & Drake, M. A. (2019). Consumer insights on prepackaged Cheddar cheese shreds using focus groups, conjoint analysis, and qualitative multivariate analysis. *Journal of Dairy Science*, *102*(8), 6971–6986. https://doi.org/10.3168/jds.2018-16209

Surat Thani Provincial Agriculture Office. (2022). *Annual report 2022.* Surat Thani Provincial Agriculture Office, Department of Agriculture Promotion, Ministry of Agriculture and Cooperatives. https://suratthani.doae.go.th/province/

Tiep, N. C., Wang, M., Mohsin, M., Kamran, H. W., & Yazdi, F. A. (2021). An assessment of power sector reforms and utility performance to strengthen consumer self-confidence towards private investment. *Economic Analysis and Policy*, *69*, 676–689. https://doi.org/10.1016/j.eap.2021.01.005

Van der Pol, M., & Ryan, M. (1996). Using conjoint analysis to establish consumer preferences for fruit and vegetables. *British Food Journal*, *98*, 5–12. https://doi.org/10.1108/00070709610150879

Wang, L., Xu, Y., Lee, H., & Li, A. (2022). Preferred product attributes for sustainable outdoor apparel: A conjoint analysis approach. *Sustainable Production and Consumption*, *29*, 657–671. https://doi.org/10.1016/j.spc.2021.11.011