

FOOD SOUVENIR PRODUCERS' ATTITUDES AND AWARENESS CONCERNING TRACEABILITY SYSTEMS IN RURAL THAILAND

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Abstract— Thai government established the standard on principle for traceability/product tracing as a tool for food inspection and as a part of the strategies for food safety and quality assurance. This research aimed to explore Thai food souvenir producers' attitudes and awareness concerning traceability systems in rural Thailand. The study employed a quantitative method research approach by using questionnaires with 400 food souvenir producers. Answers were analyzed by Chi-squared test and Spearman's correlation. The results showed that the producers were aware of the primary principles of the traceability system. The research provides insights into producers' attitudes and awareness, ways to improve existing understanding of the food souvenir supply chain, and the advantages of employing traceability systems for food souvenir manufacture.

Index Terms— Attitudes, Awareness, Food souvenir supply chain, Traceability system, Food regulations

I. INTRODUCTION

Rural areas of Thailand offer a variety of locally produced food for tourist purchases to be taken home as souvenirs. Thai foods are renowned as a national attraction, enjoying world-wide popularity. Tailanga et al [1] found that satisfaction with food was ranked by tourists visiting Thailand at 3.19, on a scale of 5. This figure indicates a high level of tourist satisfaction with Thai foods. Food production is one of the country's largest industries, with outlets ranging from street stalls to luxurious restaurants. There are many types of foods in the country and they are produced in a variety of forms, such as fresh dishes and dry packaged food souvenirs from specific localities. Currently, the food souvenir industry has increased in the number and size of producers and sales volume, to the extent that it has become a major contributor to local economies [2]. Food souvenir producers in rural areas are business families that have ancestral recipes. Most food souvenirs are manufactured in traditional ways without regard to food quality standards and the need to trace the origins of these products. For this reason, comprehension of the concept of the Food Supply Chain (FSC) is important for this sector. Food souvenirs are popular with both Thai and foreign tourists who purchase them for their families and friends. In Thailand, there is no systematic traceability of food products or traceability throughout the whole food chain [3]. Nevertheless, many private sectors have adopted it for the sake of convenience in traceability within organization, which adds value to products in high-end market, and for the purpose of international trading with countries that have such regulations. Consumers and health authorities are showing more interest in the ingredients and production controls involved in food manufacture. It is desirable for customers to be able to trace the sources of the raw materials used for manufacturing the food. Customers can be made more aware of details about the food that they eat, increasing their confidence in buying the products. Food safety and quality have taken on more and more importance in the food industry

[4]-[7], and traceability is a significant tool in the improvement of safety [8], [9] and quality. The General Food Law Regulation of European Commission defines traceability as the ability to trace and follow food, feed, and ingredients through all stages of production, processing and distribution [10]. Storøy et al [11] stated that instituting an effective traceability system can facilitate compliance with existing regulations, and answer this need for people concerned with public health issues [12], [13]. The greater certainty of safety now is part of the definition of the quality of the product [14]-[16].

Many researchers have studied on traceability adoption in the agriculture food products [17-20]. Also, most studies tend to applying new technologies for traceability systems that are suitable for particular types of products for example Ma et al [21] studied how application of smart-phone use in rapid food detection, food traceability systems, Poniman [22] examined the origin and employment of traceability system in the Halal foods network. Mehannaoui [23] illustrated the role of IoT in food traceability. There are researches about the awareness of food traceability [24] - [26]. A review of research articles and industry reports shown various studies related to traceability systems have been conducted. However, there is no research related to food souvenir traceability which can contribute to the local economies and help people in the rural areas to produce food with higher quality. This research seeks to study the attitudes and awareness of Thai food souvenir producers towards traceability systems in the lower north-eastern area where local producers are not familiar with high technology. This research is arranged in the following order. The second section presents the theoretical framework and hypotheses. The research methodology is developed and presented in the third section. The fourth section presents the results. A discussion of the research is found in section five. Finally, the conclusions are detailed in the sixth section.

II. THEORETICAL FRAMEWORK AND HYPOTHESES

The researcher synthesized the following content related to the aforementioned topics to develop the research. Fig. 1 highlights the key relationships under investigation and the associated hypotheses. The theoretical framework was built from the existing literature. The main hypotheses to be tested are the following:

A. *Cost of Food Product Recall*

Olsen and Borit [27] have discussed traceability as the collection of data concerning a product from start to finish. Proficient traceability systems are able to trace backward and forwards and determine at what stages an error occurred with food products. To ensure food product safety, internal and external traceability are both required [28]. Internally, one must be able to trace product and their components within a company. Externally, producers need to trace these among businesses and nations. [29]. Upstream tracking is important to determine where products end up being sold, while downstream tracking involves tracing the product back to its source [30]. The stakeholders require their suppliers to have an efficient and affordable traceability system both to recall products and to minimize such recalls [31]. These systems can also lower the cost of food product recalls [11], [24].

H1: A traceability system can reduce the cost of food product recalls when there is a food problem and a need to recall the product.

B. *Rapid Food Product Recall*

Retailers can use the traceability system for improving their setups for manufacturer and distribution [32], and improve the shelf-life of products as the plan for the disbursement of these products [33]. Traceability enables rapid food product recall for times of food emergencies [24], [30].

H2: These systems help enable rapid food product recall.

C. *Product Quality*

Food quality and hygiene are maintained to promote good health. There is more and more awareness of the importance of ingredients and the health aspects of food [34]. In modern times, one finds the need to present clear data about the safety and the value of products [35]. The traceability-based time-temperature system can reduce food quality loss [36] and improve product quality [37]- [39]. The quality of the product is a critical aspect of the food industry.

H3: The traceability system helps improve product quality.

D. Food Safety

Food safety is related to ensuring that a food product does not contain a food hazard [40]. The processes of manufacturing, processing, warehousing, and presenting food must be conducted in ways to prevent infection and contamination in the food production chain [41]. Traceability systems help improve product safety [4], [39], [42], [43]. It is evident that food crises such as mad cow disease, E. coli outbreaks, the toxicity of dioxins in contaminated animal feed, the horsemeat scandal, radioactive material contamination, and COVID-19 have impacted food safety and have damaged the public's perception of food industries. Aung and Chang [4] stated that such events can lead to increased safety concerns by customers.

H4: Traceability systems help improve product safety.

E. An Enhanced Image for Food Products

Heightened awareness of food quality and safety issues are crucial attributes of a food product. Traceability increases confidence and the formation of solid and long-lasting connections with business partners and customers [42]. In addition, traceability can improve the enterprise [44], [45] and enhance the food product and firm's brand name [4], [35], [46].

H5: The quality of food products and food safety have become important attributes to improve the food products' brand image.

This type of system traceability helps to reduce the cost of a food product recall enables rapid food product recall, improves product value and confidence in its safety, and leads to improvement of the image of the food product is highly relevant for the business. Finally, these factors influence the intention to commit to a traceability system.

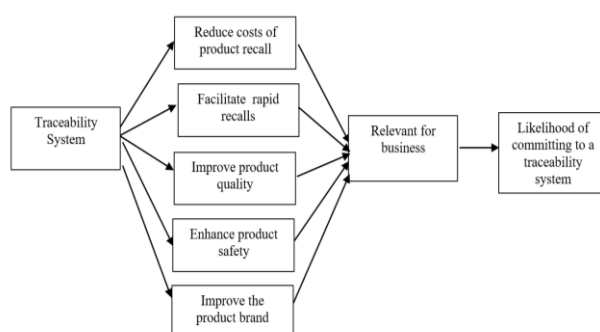


Fig. 1 Theoretical Framework

III. METHODOLOGY

This research was a survey of attitudes and awareness of Thai food souvenir producers towards a traceability system and applied a quantitative research approach by using a questionnaire to gather the food souvenir producers' attitudes about and awareness of traceability systems. The sample group involved 400 food souvenir producers in the lower north-eastern Thailand region. The research studied food souvenir producers in the lower north-eastern area as many food souvenir products are made from beef, pork and fish, for example ISAN sausage, white pork sausage, Chinese style sausage, dried shredded pork, sour pork, sour fish, and sour beef among others. The producers of these products were to provide details about the source of ingredients. One difficulty was that the food souvenir producers in this region are not familiar with high technology.

This research used a questionnaire, for it was believed to be the best technique to acquire data from the food souvenir producers in lower northeastern Thailand, a large population difficult one may observe only indirectly [47]. The questionnaires collected information about attitudes and awareness from the participants. Purposive sampling was used as a sampling method to gather representative

data from food souvenir producers in Ubon Ratchathani, Sisaket, Yasothon, and Amnat Charoen. A total of 412 food souvenir producers completed the questionnaires, and 400 questionnaires were valid. Twelve questionnaires were left incomplete and were rejected. Answers were analyzed by the Chi-squared test, as the data was descriptive and categorical [48]. In addition, Spearman's correlation was calculated on the variables on which the Chi-square demonstrated dependency. The calculations were undertaken through the Statistical Software Package for Social Science.

The questionnaire items to test attitudes and awareness were modified from [24]. The questions to test awareness were 1) Traceability assists in the reduction of costs of a product recall; 2) A traceability system reduces the probability of product recall; 3) A traceability system allows quick recall of products in case of problems; 4) A traceability system improves product safety; 5) A traceability system enhances product quality; 6) A traceability system improves the image of my product. The questions to test attitudes were 1) Traceability is highly relevant for my business; 2) I intend to invest in a traceability system for my business.

IV. RESULTS

This section presented the findings from the analysis of the results. The questionnaires were collected from the food souvenir producers in Ubon Ratchathani, Sisaket, Yasothon, and Amnat Charoen with 400 valid questionnaires. The participant profiles are shown in Table 1. It was found that most of the food souvenir producers are single proprietorships and small-sized businesses (94.5%), they made the product themselves and sold them at tourist places. According to Fig. 2, most producers agree to invest in the traceability system at a moderate level. The single proprietorship and small-sized businesses have limited capital and most of them were not familiar with new technology, and therefore, they were hesitant to invest in the traceability system.

Table 1 Participant profiles

Sample Characteristics	Percentage
Business Size	Small 378 (94.5%), Medium 22 (5.5%)
Types of Business	Single Proprietorship 378 (94.5%), Partnership Limited 2 (0.5%), Ordinary Partnership 6 (1.5%), Community Enterprise 14 (3.5%)

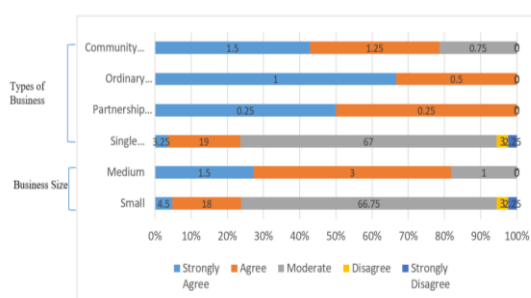


Fig. 2 Intention to invest in a traceability system divided by types of business and business size

According to table 2, in terms of awareness, the food souvenir producers were convinced that the ability to trace products helps in reducing the costs of a product recall at a moderate level (3.13), help to lessen the likelihood of a product recall at a moderate level (3.19) and make possible a speedy

recall of products in case of food emergencies at a high level (3.41). The producers strongly agreed that the traceability system can improve product safety at 4.36 and believed that the traceability system can improve product quality at 4.50. The producers strongly believed that a traceability system can improve the image of products at an average score of 4.66. Most producers were small-sized businesses who believe that a positive image for the product can increase sales volume.

In terms of attitude, the producers agreed that traceability is highly relevant for their businesses at an average score of 3.84. However, they were willing to invest in the system only at a moderate level at 3.25. From the in-depth interviews, some of the producers revealed that they do not want to divulge the secret ingredients of their products. In addition, they have limited budgets to invest in such systems.

Table 2 Attitudes and awareness of food souvenir producers

Item	Frequency					\bar{x}	SD	Level of Agreement
	5	4	3	2	1			
Awareness								
1. Traceability assists in the reduction of costs of product recall.	12 3%	128 32%	168 42%	84 21%	8 2%	3.13	.652	Moderate
2. A traceability system reduces the probability of product recall.	52 13%	60 15%	212 53%	64 16%	12 3%	3.19	.623	Moderate
3. A traceability system allows quick recall of products in case of problems.	60 15%	84 21%	230 57%	15 4%	11 3%	3.41	.604	Agree
4. A traceability system improves product safety.	242 61%	92 23%	44 11%	13 3%	9 2%	4.36	.598	Strongly Agree
5. A traceability system enhances product quality.	273 68%	87 22%	17 4%	15 4%	8 2%	4.50	.554	Strongly Agree
6. A traceability system improves the image of my product.	321 80%	48 12%	14 3%	11 3%	6 2%	4.66	.413	Strongly Agree
Attitude								
7. Traceability is highly relevant for my business.	152 38%	76 19%	140 35%	20 5%	12 3%	3.84	.869	Agree
8. I intend to invest in a traceability system for my business.	24 6%	84 21%	271 68%	12 3%	9 2%	3.25	.586	Moderate

1.00-1.80= Strongly Disagree	1.81-2.60= Disagree	2.61-3.40= Moderate	3.41-4.20= Agree	4.21-5.00= Strongly Agree
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The results of the Chi-square test and the Spearman correlation are illustrated in tables 3 (Awareness) and 4 (Attitude). According to the tables, the producers believed that the traceability system can help rapid product recall, improve food safety and quality and finally improve product image to a great degree.

Table 3 Awareness of traceability of food souvenir producers: Spearman's correlation results and the Chi-square test

No	Item	Chi-square value	P-Value	Spearman's correlation ⁽¹⁾
1	Reduce recall cost (Q1) & Reduce recall probability (Q2)	6.25	0.539	0.27 (Modest)
2	Reduce recall cost (Q1) & Allow rapid recall (Q3)	10.23	0.264	0.43 (Moderate)
3	Reduce recall cost (Q1) & Improve product safety (Q4)	5.78	0.422	0.31 (Moderate)
4	Reduce recall cost (Q1) & Improve product quality (Q5)	8.22	0.353	0.36 (Moderate)
5	Reduce recall cost (Q1) & Improve product image (Q6)	11.02	0.063	0.44 (Moderate)
6	Reduce recall probability (Q2) & Allow rapid recall (Q3)	9.34	0.381	0.39 (Moderate)
7	Reduce recall probability (Q2) & Improve product safety (Q4)	12.45	0.077	0.35 (Moderate)
8	Reduce recall probability (Q2) & Improve product quality (Q5)	13.20	0.064	0.37 (Moderate)
9	Reduce recall probability (Q2) & Improve product image (Q6)	14.73	0.058	0.49 (Moderate)
10	Rapid recall (Q3) & Improve product safety (Q4)	28.54	0.055	0.51 (Strong)
11	Rapid recall (Q3) & Improve product quality (Q5)	30.25	0.052	0.67 (Strong)
12	Rapid recall (Q3) & Improve product image (Q6)	31.43*	0.048	0.75 (Strong)
13	Improve product safety (Q4) & Improve product quality (Q5)	39.18*	0.044	0.81 (Very Strong)
14	Improve product safety (Q4) & Improve product image (Q6)	45.12*	0.032	0.88 (Very Strong)
15	Improve product quality (Q5) & Improve product image (Q6)	47.49*	0.016	0.91 (Very Strong)

*= significant at the 0.05 level (2-tails)

(1) = Spearman's correlation value interpretation (Muijs, 2011, p.111)

0-0.1=Weak	0.01-0.30=Modest	0.31-0.50=Moderate	0.51-0.80=Strong	0.81-1.00=Very Strong
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Table 4 Attitude of traceability of food souvenir producers: Spearman's correlation results and the Chi-square test

No	Item	Chi-square value	Sig (2-tailed)	Spearman's correlation ⁽¹⁾
16	Reduce recall cost (Q1) & Relevance of traceability (Q7)	4.40	0.067	0.52 (Strong)
17	Reduce recall cost (Q1) & Intention to invest (Q8)	2.13	0.256	0.34 (Moderate)
18	Reduce recall probability (Q2) & Relevance of traceability (Q7)	5.21	0.148	0.43 (Moderate)
19	Reduce recall probability (Q2) & Intention to invest (Q8)	3.37	0.324	0.39 (Moderate)
20	Rapid recall (Q3) & Relevance of traceability (Q7)	26.43	0.062	0.57 (Strong)
21	Rapid recall (Q3) & Intention to invest (Q8)	8.22	0.346	0.48 (Moderate)
22	Improve product safety (Q4) & Relevance of traceability (Q7)	31.28*	0.042	0.65 (Strong)
23	Improve product safety (Q4) & Intention to invest (Q8)	19.60	0.127	0.40 (Moderate)
24	Improve product quality (Q5) & Relevance of traceability (Q7)	32.45*	0.049	0.74 (Strong)
25	Improve product quality (Q5) & Intention to invest (Q8)	17.53	0.088	0.41 (Moderate)
26	Improve product image (Q6) & Relevance of traceability (Q7)	43.10*	0.032	0.76 (Strong)
27	Improve product' image (Q6) & Intention to invest (Q8)	22.76	0.057	0.35 (Moderate)
28	Relevance of traceability (Q7) & Intention to invest (Q8)	18.34	0.211	0.32 (Moderate)

*= significant at the 0.05 level (2-tails)

(1) = Spearman's correlation value interpretation (Muijs, 2011, p.111)

0-0.1=Weak	0.01-0.30=Moderate	0.31-0.50=Moderate	0.51-0.80=Strong	0.81-1.00=Very Strong
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V. DISCUSSION

The food souvenir producers were aware of food traceability. Firstly, they strongly agreed that a food traceability system helps to improve product safety (4.36), in accord with [39], [41], [49]. Secondly, they believed that food traceability will help to improve product quality (4.50) [24], [39] and it was discovered that a traceable system for foodstuffs drives the improvement of food safety and quality (see Table 3 No. 13). Thirdly, it was shown that a traceability system can improve the positive image of products (4.66) according to [4], [46], and increase the trust of customers [50]. From the in-depth interviews, it was found that the food souvenir producers believed that applying new technology like a traceability system will help their products look fashionable and modern as their customers are able to trace back the food ingredients, leading to trust in the quality of the food. Table 2 No. 15 supports the idea that there is a correlation between food quality and the positive image of a product. However, Corallo et al [18] found that a traceability system was not beneficial for improving the company brand. A difference of sample groups among food souvenirs and agriculture food producers could be the reason for a different agreement. The food souvenir producers moderately agreed that a food traceability system helps in reducing both the costs and probability of product recall. Most of the food souvenir producers produced and sold their products locally and therefore the issue of product recall was not the main issue for them.

On the other hand, the attitude of food souvenir producers indicated that a system for tracing products was very important for their businesses at an average score of 3.84. Most agreed moderately (3.25) to invest in a traceability system for their business. The in-depth interviews were used to find out about this issue. Some of them revealed that they were afraid that their food formulation secrets would be revealed if they applied the traceability system to their businesses. There was also resistance to changing to new methods of food processing according to long-established and reputable souvenir producers.

In Thailand, the government is promoting the idea of Thailand 4.0 by encouraging local businesses to apply new technologies to help the business processes to be more efficient and effective. The government also wants Thai foods and products to become recognized as high-quality products marketable worldwide. A good traceability system can support the Food Tech Silicon Valley project which aims to create future economic competitors who are dedicated to increasing access to better, safer, and more nutritious foods, and to future-proofing the global food supply chain for sustainable businesses. Provincial governors also play an important role in helping local businesses in their areas to apply new technologies.

This research was a project that supports the government's ideas. According to the research findings, one of the requirements to better utilize a food souvenir traceability system is to provide education about traceability systems to the food souvenir producers in the lower north-eastern area. Some producers feared that the system implied that they would have to reveal all of their food formulation secrets if they applied the traceability system. A thorough understanding of the necessity of a traceability system is also important to make more food souvenir producers willing to implement the system and reduce the resistance to change to a new way of food processes according to long-established and reputable food souvenir producers. Local government should inform food souvenir producers that they do not have to give out all details of their products. The authorities should also provide knowledge about how a traceability system can help improve product standards. In some developed countries, traceability systems are compulsory for meat products. To be compatible with world standards, the Thai government should introduce regulations enabling the tracing of products' ingredients.

VI. CONCLUSION

This research explored the attitudes and awareness of Thai food souvenir producers towards a traceability system. A quantitative research approach was used to survey attitudes and awareness of 400 Thai food souvenir producers in the lower north-eastern area towards a traceability system by using a questionnaire. Answers were analyzed by quantitative tools, for example, frequency, average, standard deviation, Spearman's correlation results, and the Chi-square test.

The findings show that most food souvenir producers are aware of the role of these systems to trace food production and distribution in the improvement of food safety and quality. Applying the system also reinforces a positive image for their products. The food souvenir producers had a positive attitude toward traceability systems. However, they only agreed at a moderate level to implement the system. Some of them revealed that they were afraid that their food formulation secrets would be revealed if they applied the traceability system to their businesses. There was also resistance to change to new methods of food processing according to long-established and reputable food souvenir producers. To be compatible with world food standards, the Thai government should provide more knowledge about traceability systems and encourage producers to implement the systems by introducing regulations promoting the tracing of product ingredients.

The major limitation of this research is that it studied only the food souvenir producers in the lower north-eastern area of Thailand. The producers from this region may have different awareness and attitudes toward traceability systems compared to producers in other parts of Thailand. The study of food souvenir producers in other regions will extend the usefulness of the study.

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