Comparative Study of the Bread and Bakery business in Japan and Thailand: A Guideline in Flour and Controlled Temperature for Thai Bakeries

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Abstract

This research shows that Thai bakeries seem to have lesser product quality than Japanese bakeries and that Flour and Controlled Temperature might be critical factors influencing the quality difference between the two countries. Our objective was to identify the critical elements that make Japanese bakeries more successful, considering that Flour and Controlled Temperature are the "Basic Kitchen Principles" used by professional bakers. We conducted a questionnaire and interviewed 20 Japanese bakeries in Niigata city. We recorded the type of flour and monitored the temperatures (i.e.: temperature loggers in 5 professional premises) that are used by professional bakers, and identified significant positive correlations between flour and techniques. Consequently, the results validated that the influence of temperature in the premises and in particular the choice of a quality flour can significantly affect the quality of bakery products. As an outcome of this research, we have provided a flour and temperature guideline that can be used as inspiration for producing quality bakeries.

Introduction

In Thailand these days, there is increased consumption of bakery products due to changes in people's lifestyles. A number of new bakeries have been opened [1], and many tasteful Thai style bakeries have created new products for instance coconut custard filled buns, and flossed pork buns. These bakeries are not operated solely by Thai people but are joint ventures between Thai and foreign companies either from Europe or other Asian countries like Japan and Hong Kong [1].

Thai people tend to buy baked products from those franchises as a result of local bakeries producing lower quality products in terms of texture and suppleness and as a further result have a lower market share to that of franchised bakeries [1]

On the other hand in Japan, bakeries are run solely by local bakers, which are well known in terms of quality, and creativity. Plenty of popular new products were first created from local bakers for example Melonpan, Currypan, and Anpan. Moreover in Japan, a good deal of European style bakeries can also be found without much effort and operated by local Japanese.

We were interested in Thai and Japanese bakeries due to the perception that Thai bakeries product quality is viewed as lower than that of Japanese bakeries. We wanted to know the connection between production quality and the overall look and taste that can lead to a successful bakery business. In order to understand the reason, we created questionnaire and conducted interviews, in-store observations, and collected real-time temperature readings by using temperature loggers.

Previous studies that we have examined featured the relationship between production and quality, such as the protein content in flour and the temperature control in bakeries, which can lead to a successful business. According to Aamodt [3] Flours of strong protein quality produced hearth loaves with larger loaf volume, larger bread slice area, and higher form ratio (height/width) than flours of weak protein quality. In Dowell [4] For loaf volume models, grain or flour protein content was the most important parameter included. In his book, "*The Taste of Bread*"[4], Prof. Raymond Calvel points out that average mixing temperatures vary between 24 degrees Celsius and 25 degrees Celsius.

This study is the first to conduct field research from top bakeries in Niigata city by observing their working processes in the kitchen, the atmosphere, equipment and followed up with a questionnaire for revealing their tips on running a successful bakery business.

Added to this by using the 4 P's of marketing companies can improve their chance of success and realize their goals for example profitability, raising sales volume, market share, return on investment etc. (Table 1)[2].

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Table 1 The 4 P's of marketing

Product	Price	Promotion	Place
Design	Retail	Strategies	Special offers
Technology	Wholesale	Skimming	Endorsements
Usefulness	Internet	Penetration	Advertising
Value	Direct sales	Psychological	User trials
Convenience	Peer to peer	Cost-plus	Direct mailing
Quality	Multi channel	Loss leader	Leaflets/posters
Packaging			Free gifts
Branding			Competitions
Warranties			Joint ventures

The general objectives of this paper are;

1. To find the key factors that result in local Japanese bakeries having a better quality products than that of local Thai bakeries
2. To guideline how a successful local Japanese bakeries are run in order for local Thai bakers to follow.

Previous observations of the Thai-kitchen environment are that it is poorly managed. In particular, there is no regard given for an optimum kitchen temperature. As a result the overall quality of the baking process is unsatisfactory, turning away current and potential customers from Thai bakeries to Japanese style bakeries and franchises.

Based on earlier observations and reports, we have formulated the following hypothesis:

> *If bakery products are of good quality it may lead to a successful business. And to achieve this "flour and controlled temperature" are the science. If correct it should provide the incentive for Thai bakers to follow.*

Central to the context of this research has been our keen interest in the relationship of quality and the overall look and taste that can lead to a successful business. And on what factors make these delightful to customers. Therefore the question we put forward was, do Japanese bakers pay particular attention on ingredient selection, production and a controlled temperature in and around the kitchen to maintain and improve products quality?

Methods of study

(i) Questionnaire and interviews

We handed out twenty questionnaires to twenty top quality bakeries in Niigata city, which scored over 3.4 out of 5.0 on the popular food rating website Tabelog.com. We sent the questionnaires enclosed with a pre-paid return-address envelope. The questions asked covered quality control, production technology and ingredients. We then asked for a sixty-minute interview in order to research deeper into their questionnaire answers. The questions were written both in English and Japanese. From the twenty bakeries we received ten replies and of them, five out of the ten accepted our sixty-minute interview request.

The questionnaire was designed to enable us to understand how Japanese bakeries have become successful and what they think are the factors that make for quality bakeries. Also how do they create new products, maintain a high quality standard and their production technology. The participant bakeries were asked to answer several questions including;

How is flour selected?
How do you create new products?
What makes quality products?

The five bakeries included two specializing in bread-based products, two cake shops, and one traditional local Niigata city confectionary maker. The interviews were conducted in Japanese and took about sixty minutes.

(ii) In store Observation

We observed four top quality bakeries in Niigata city, spending on average seven days per bakery for a total of thirty days. The four were a Japanese and European style bakery, a European style patisserie, and a French style café-restaurant. And in Uonuma city, one day at a small local family owned sweet potato confectionary maker. Finally we spent one further day in Ojiya city at a local rice flour confectioner. The purpose of our observation was to see bakers working in real-time. In particular how they streamline their working processes in the kitchen, use their equipment to produce bakery products, and their ingredients' inventory management system in comparison to a Thai bakery.

(iii) Temperature Logger

We had temperature loggers put in five bakeries, four in Japanese bakeries in Japan and one in a Thai bakery in Thailand, for twenty-four hours over six days. This was in order to record and collect the real-time kitchen temperature data, and then compare the temperature results from both countries.

Responses from the questionnaire and interviews

The questionnaire was sent to twenty top quality bakeries nationwide in Japan. We received ten questionnaires in response from the bakeries and of those five agreed to interviews, which we conducted. From the ten questionnaires, we summarized the data into a percentage and placed the data into graphs as shown below.

From the questionnaire Question 6: Asked how new products are developed? Eighty percentages said they create new products based on seasonal ingredients. Another said they use as much fruit and as many vegetables as possible. And another said, they produce special products for people with allergies (Figure 1).

Question 7: How is flour selected? Eighty percentages said they buy according to the sales-representative's advice and experimenting with product samples. Ten percentages said they buy only "Made in Japan" products and the remaining look at protein and ash content (Figure 2).

Question 8: What makes quality products? Out of all responses, eighty percentages said techniques, play a more important role compared to good technology (Figure 3).

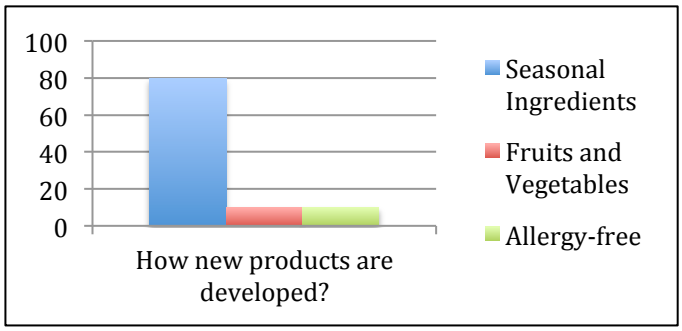

Figure 1 How new products are developed?

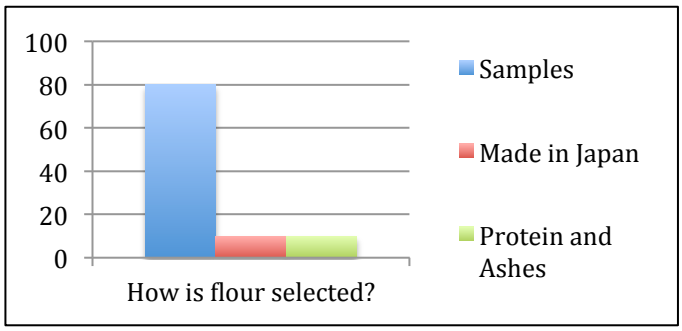

Figure 2 How is flour selected?

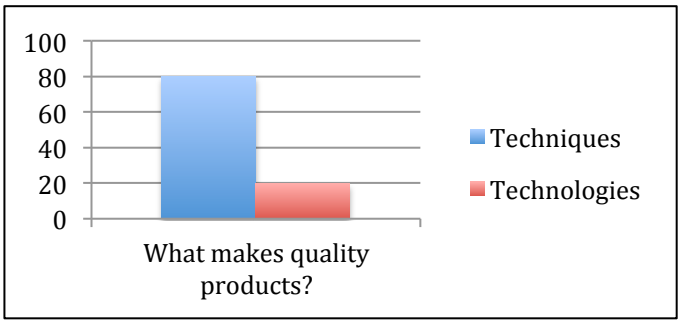

Figure 3 What makes quality products?

In the interviews we asked the same questions. Four out of the five interviewees said they are constantly learning new ideas by making study trips to overseas bakeries. Further two out of five interviewees said good flour is really important; therefore you need good advice from a sales-representative. This is due to a good sale-representative being able to recommend the right protein and ash content in flour, as required.
One particular interesting answer was that Japanese style bread does not require as high a quality oven as for baking European style bread. The most important point is to focus on the overall temperature of the kitchen when baking because this affects the quality of the products. (See Appendix)

In store Observation results

The field research was an on-sight observation of how professional kitchens works. The period of observation covered thirty days and two methods of study. In that time we observed different styles of kitchen organization (Table 2).

Table 2 The differences in kitchens of Japanese Bakeries and a Thai Bakery

Countries	**Japan**				**Thailand**
Bakeries/ Shop types	**A** Japanese Bakery	**B** European Bakery	**C** European Cake shop	**D** French café and Restaurant	**F** Bakery
Air-conditioned kitchen	✓	✓	✓	✓	Open air
Working island with fridges underneath	✓	✓	✓	✓	Kitchen tables
Automatic electric oven	✓	✓	✓	✓	Gas oven
Dough kneading machine	✓	✓	✓	✓	✓
Dough proofer	✓	✓	✓	✓	Room temperature rise
Dough sheet maker	✓	✓	✓	n/a	n/a
Dough roller machine	✓	✓	n/a	n/a	n/a
Semi-automatic dough divider	n/a	✓	n/a	n/a	n/a
Freezer room	✓	✓	✓	✓	n/a
Refrigerated room	✓	✓	✓	✓	Refrigerator

From our observation, every kitchen had air-conditioning, which could keep the kitchens' temperature to around 25 degrees Celsius. Moreover one of the reasons of maintaining the bakeries quality is that they use a dough proofer, which has around 28 degrees Celsius with the humidity between seventy-five percentages and eighty percentages to control the dough's rising [6]. Furthermore and significantly we saw that every kitchen had a good quality refrigerated system to keep their ingredients fresh.

However a controlled-temperature and quality flour selection seemed to be disregarded at the local producers in Uonuma and Ojiya city. Since there was no use of the available air-conditioning, and little concern regarding ingredients like flour, we could clearly see are resulting lack of kitchen organization and production consistency.

Temperature logger results

The temperature loggers recorded kitchen temperatures at 1440 points through each day for one minute per point (Figure 4.). The graph Japan (Jpn) Bakery 1 and Jpn Bakery 2 show rather constant temperatures at around 20 degrees Celsius to 25 degrees Celsius. Jpn Bakery 3 shows a temperature lower than 25 degrees Celsius from around midnight until before 6 A.M. because there is no activity in the kitchen. Between 6 A.M. and 6 P.M. the temperature plateaus at around 29 degrees Celsius. On the other hand the temperature in Jpn Bakery 4 peaks, fluctuates and peaks again at around 27 degrees Celsius and 30 degree Celsius between 6 A.M. and 6 P.M. Lastly, temperature in Thai kitchen seems to be the highest 28 degrees Celsius to 31degrees Celcuis.

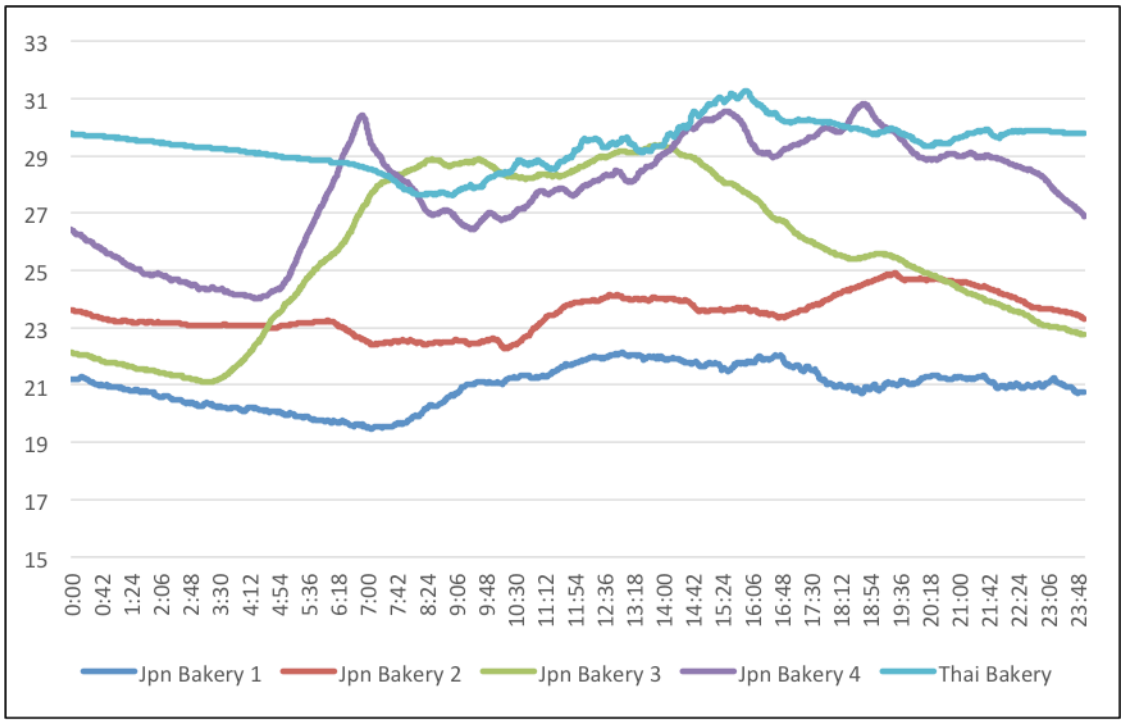

Figure 4 Collected temperature in 4 Japanese bakeries and 1 Thai bakery

Flour market in Thailand and Japan

Flour is a key ingredient for making quality products. The flour type and protein content is a key specification for wheat and flour purchasers since it is related to many processing properties, such as water absorption and gluten strength. Protein content can also be related to finished product attributes, such as texture and appearance. Ash is a mineral content that remains in the flour after milling can affect color, imparting a darker color to finished products [7].

Flour that is being sold and used by Thai bakeries does not give does not give any detailed information about protein and ash content. It states only purposes for use, such as bread flour, cake flour, and all-purpose flour (Figure 5). Moreover, since wheat production in Thailand is insignificant due to climate

conditions, and other reasons, Thailand has to import wheat from the U.S. and Australia. The wheat and then milled and re-packaged by Thai companies [8].

However though flour that is being sold in Japan is like Thailand imported as wheat from the U.S., Australia, and also Canada [9], details on protein and ash content are given (Figure 6).

Figure 5 Flours that are being sold in Thailand

Figure 6 Flour catalogue from a Japanese sale-representative

Conclusions and Discussion

The primary conclusion of this paper is that "flour quality and the controlled temperature" are crucial to operating a successful bakery business. And in order to produce superior quality products that evoke great feelings and provide an exceptional experience for customers, professional bakers should use "Basic Kitchen Principles".

From the questionnaire and interview results, we have learned that Japanese bakeries select good quality flour according to advice received from the sales-representative, which is an unfamiliar practice in Thailand. Japanese bakeries also consider ash and protein content before purchasing flour. Moreover Japanese bakeries consider techniques over technology, know-how on baking temperature and the right flour to use, which leads to a quality product. Finally new products are introduced every season based on seasonal fruits (Table 3) to boost sales.

Table 3 Samples of Seasonal Fruits in Japan

Months	Fruits
January	Strawberries, Citrus fruits, Apples, Mikan
February	Strawberries, Citrus fruits, Apples, Mikan
March	Strawberries, Citrus fruits, Apples
April	Strawberries, Citrus fruits, Apples, Loquat
May	Loquat, Cherries, Melons, Watermelons
June	Loquat, Cherries, Melons, Watermelons, Apricots, Plums
July	Cherries, Melons, Watermelons, Apricots, Plums, Peaches, Grapes
August	Melons, Watermelons, Plums, Peaches, Grapes, Figs, Japanese Pears
September	Melons, Plums, Peaches, Grapes, Figs, Japanese Pears, Chestnuts, Persimmons, Pears, Apples
October	Grapes, Figs, Japanese Pears, Chestnuts, Persimmons, Pears, Apples, Mikan
November	Chestnuts, Persimmons, Pears, Apples, Mikan
December	Persimmons, Pears, Apples, Mikan

*Source: Production, Marketing and Consumption Statistics Division, Ministry of Agriculture, Forestry and Fisheries[10]

The semantic list that forms the bakery kitchen's framework for superior baked products has been created from this research (Table 4) (Table 5). For example, data collected from professional kitchens by observation and questionnaire. From this data collected, in the context of professional kitchens, bakers produce higher quality products and are far more productive if they use the "Basic Kitchen Principles" in their kitchens. Therefore, the following findings and suggestions will be of interest to bakers, and researchers.

Guidelines and Recommendations for Thai Bakeries

The following guidelines are based on the findings of this study. The results strongly suggest that:

The ideal temperature for a professional bakery kitchen should be around 20 degrees Celsuis to 25 degrees Celsius, which affect dough quality and other ingredients like butter. A dough proofer should be used to raise dough in a controlled temperature and humidity environment (Table 4).

Moreover the flour protein content guide makes a significant impact on the final quality of products, as protein is an indicator of a products' suppleness. It's necessary for bread to look for flour with a high protein content, around 13%-14%. For cake making and other products that do not require as much suppleness, protein content should be around 8 %. Lastly for pastries, which have more fat need a little higher protein than cakes in order to be able to hold the fat (Table 5).

Table 4 Ideal temperatures in kitchens

Conditions	Temperature (°C)
Kitchen	Around 20°C to 25°C
Dough rising temperature	Around 26°C to 29°C Humidity around 60% to 80%

Table 5 Flour guide for making quality bakeries

Flour Guide		
Protein content (%)	**Ash content (%)**	**Purposes**
8.5 ± 0.05	0.48 ± 0.02	Pastries
8.0 ± 0.05	0.38 ± 0.02	Cakes
13%-14% ± 0.02	0.53 ± 0.02	Breads

- Bakers should find inspiration from the work and methods used by successful professional bakers in order to embed the Basic Kitchen Principles established in this paper in their baking techniques.
- Using the Basic Kitchen Principles should significantly improve the bakeries quality and working conditions.

According to our research, we believe that Japanese bakeries quality compared to those of Thailand is primarily a matter of kitchen organization, a focus on quality, and a good work atmosphere.

Perspectives

Although Thailand imports various amount of its wheat from the same sources as Japan, the difference in flour quality is accounted for due to Thailand's lack of flour research and study.

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Appendix

Questionnaire and Interview Questions 2015/8/ 3

1. お店に込められた思いを教えてください。
お店を開店しようと決めたきっかけ（理由）は何でしたか？
Please tell a suggestion you have made that was implemented in your shop?
(The reasons that you've decided to open this shop.)

2. 何年お店を経営されていますか？
How long you've been in this business?

3. どのような新しい商品に取り組んでいますか？
What is your challenge? The challenge to bake new style of breads/ if customers are going to like your products/ they're so many bread shops have been opened, how do you think you can compete with them?)

3-1. 新しいスタイルのパンを焼き上げるための試みにはどのようなものがありますか？
Is it challenging to the shop to bake new style of breads?

3-2. お客様があなたの商品を好きになるためにどのような努力をしていますか？
How do you deal with customers' comments on your products?

3-3. 沢山のパン屋さんが開店していますが、あなたのお店はどのように競争していけると考えていますか？
How do you think you can compete with the newly opened shops?

4. あなたのお店の強みはなんですか？
What is your strength?

4-1. なぜ、あなたのお店の評価が高いと思いますか？
Why do you think your breads are good?

4-2. なぜ、リピータのお客様が多いと思いますか？
Why customers come back to your shop?

4-3. 最も自信のある商品は何ですか？
What are your best products?

5.あなたのお店の弱点はなんですか？
What is your weakness?

5-1 もっとお店を良くするためにできることは何だと思いますか？
What do you think you can do better?

5-2 もっと高品質の商品をつくるため習得中の（習得しようとしている）技術はありますか？
Is there any technique that you're mastering to make better quality?

5-3 弱みや問題点はどのように克服できると思いますか？
How do you deal with those weakness or problems?

5-4 お店の経営や商品についてパン屋の友達と相談していますか？
Do you consult among your baker friends?

6.どのように新商品のアイデアを考え出していますか？
How do you come up with new products?

6-1. どのようにして新商品を実際に作り出していますか？
How do you create your new products?

6-2. 新商品がお客様に評価されない場合どのように対処しますか？ 販売を停止しますかそれとも味や食感を修正しますか？
What if customers don't like the new products, what will you do? Stop selling or adapt the tastes?

7. 小麦粉をどのように選択していますか？
How do you select good flour?

7-1.その他の原料をどのように選択していますか？
How do you select good ingredients?

8.良い製品を作るため、どのような種類の食品生産技術を使用していますか？
What kind of technology in food producing are you using? (to make good products)

9. 本アンケートの回答内容を正確に理解するため 1 時間以内のインビュー調査に協力頂けますか？

1.協力できる　　2.協力できない　　3.わからない