

## **Marketability of new product development towards minimising market failure: A case of mango fruit leather**

(Kebolehpasaran pembangunan produk baharu ke arah meminimumkan ketidakupayaan pasaran: Kes gegelung mangga)

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Keywords: mango fruit leather, consumer acceptance, marketability, willingness to buy

### **Abstract**

Malaysia's modern food industry recognises an increasing role of new food product development (NFPD). However, the new food products tend to demonstrate high probability of failure. The NFPD emphasises less on the important role of consumer's evaluation, thereby subjecting the new food product to higher probability of failure prior to entering the market. Assessing consumer's evaluation is therefore imperative to minimise the incidence. This study reports on consumers' evaluation of a new food product known as mango fruit leather developed by MARDI by examining the overall product acceptance, product attributes and willingness to buy at pre-determined recommended price. A self-administered, structured questionnaire was randomly distributed to 400 consumers, who voluntarily participated in the survey, at selected hypermarkets/supermarkets located in the Central Zone. The survey recorded high percentage of consumers' overall product acceptance (93%) with all the product attributes indicating high percentages for colour (91%), texture (90%), aroma (83%) and size (88%), respectively. Besides, 87% of consumers indicated their willingness to buy the mango fruit leather and almost 70% agreed to buy the product at the recommended price of RM4.00/25 g. The study also found a positive relationship between the consumers' overall product acceptance and willingness to buy. Ethnicity and income group were the two socio-economic factors that significantly influenced their willingness to buy. The findings of this study are beneficial for the food industry players and provide hints for drawing effective marketing strategies in NFPD whilst addressing the failure of a new food product in a new or existing market.

### **Introduction**

New food product development (NFPD) plays a major role in the modern food industry (Kemp 2013; Lesschaeve and Bruwer 2010). The Government of Malaysia placed special emphasis on the development of high-value downstream research in line with the establishment of the National Agro-Food Policy (2011 – 2020). The NFPD is

expected to not only expand the domestic markets, but also caters the increasing demand especially for functional food sector, underpinned by the health-conscious consumers. The demand for functional food in Malaysia has gradually grown in tandem with the increase awareness in health (Nor Amna A'liah et al. 2016). More Malaysians are becoming health

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conscious which subsequently leads to the increase purchase of functional food (Stanton et al. 2011).

However, literature suggested that NFPD is highly associated with high probability of failure due to well documented factors such as poor customer acceptance from both marketing and sensory perspectives, efficacy and legislative issues concerning functional food labels, poor customer education, incorrect pricing, promotional and positioning strategies and ineffective market segmentation (Heasman and Mellenetin 2001; Hilliam and Young 2000; Wennstrom 2000; Gray et al. 2003). Almost 70 to 90% of new functional food and beverages failed within the first year in the market (Bogueet al. 2005). In the absence of strategic planning in the NFPD, such undesirable failure will continue to slow down NFPD and possibly hamper the growth of modern food industry in Malaysia.

The consumer-oriented new product development attempts to find more balanced inputs from both the consumers and technologies, and to incorporate consumers' understanding as an integral part in all stages (Grunert and van Trijp 2014). The consumers' acceptance criteria for new food product should be drawn from a unique relationship between particular characteristics (or attributes) of the new product, human perception and psychological response (Guine et al. 2012), which are crucial to minimise the risks of failure through sensory analyses and market studies (Guiné et al. 2016).

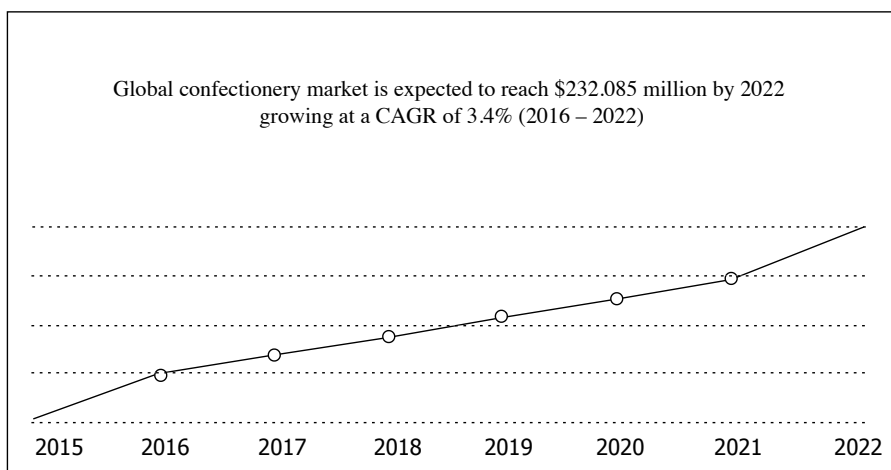
In the modern food industry, consumers' evaluation is important which partially signals the success of production, marketing and consumption of food (Mogendi et al. 2016). Jang and Namkung (2009) observed that food attributes have become the main criteria in the consumer's decision making. In addition, Enneking et al. (2007) realised that understanding the importance of food attributes was a pre-requisite of the food choice at the point of sale. In ensuring high success of new food

product in a market, consumer's voice plays a vital role (Dijksterhuis 2016; Grunert et al. 2010; Kemp 2013; Van Kleef and van Trijp 2007) as it has become a widely accepted dimension in today's innovation practices (Moskowitz and Hartmann 2008). Guiné et al. (2016) also stressed that the food product development was highly dependent on consumers perception and acceptance towards minimizing failure probabilities. In a nutshell, food attributes should be highly regarded as an important assessment in understanding the consumer's evaluation towards purchasing a new food product. Besides, this study is useful and beneficial for the food industry players and also for effective marketing strategy towards new food product development.

### ***Mango fruit leather***

The mango fruit leather is a confectionery derived from premium mangoes developed by the Malaysian Agricultural Research and Development Institute (MARDI). Premium fruits refer to fruits containing rich and high nutrient contents which contribute the major source of vitamins, minerals, fibres and active components e.g. antioxidants from phenolic acid groups. Mango fruit leather also contains high content of antioxidants and important anti-radicals which could reduce several chronic diseases (Gujral and Brar 2003). Besides being eaten fresh, the premium fruits can also be processed into a variety of delicious and popular food products including juices, desserts and other confectioneries. Fruit leather, on the other hand, refers to dried fruit bar or fruit slab containing lower fat, higher fiber and carbohydrate, a lightweight and more convenient snack (Raab and Oehler 1976; Ayotte et al. 1980). It is also a restructured fruit from pulps or concentrated mixed fruits after several complex stages of drying (Huang and Hsieh 2005; Maskan et al. 2002).

*Figure 1* illustrates the steady growth of the global confectionery market owing



Source: Allied Market Research Report 2017

Figure 1. Global confectionery market opportunities and forecasts (in USD million), 2015 – 2022

to high demand for confectioneries from middle-class consumers.

Allied Market Research (2017) reported that the global confectionery market size was valued at \$184,056 million in 2015, and is expected to reach \$232,085 million by 2022, with CAGR of 3.4% during the forecast period 2016 – 2022 (Figure 1). This shows that the global confectionery market continues to increase over the years and product innovation, growth in health awareness and demand for sugar-free, organic and low-calorie products are the main drivers underpinning the confectionery sector. Therefore, the development of the mango fruit leather takes this opportunity to contribute and value-add the mango-based product in Malaysia. In the international market, fruit leathers had been widely produced and marketed especially in Europe such as apricot, grape and kiwi fruit leathers.

The mango fruit leather is also considered as a functional confectionary from premium fruits. The National Agro-Food Policy (2011 – 2020) gave emphasis on local food production, which focus on increasing the efficiency, productivity and competitiveness of the local food production industry along the value chain. The functional food industry in Malaysia is gradually gaining attention due to the

increase in health consciousness and awareness (Nor Amna A'liah et al. 2016).

Prior to disseminating the processing technologies to the food industries, it is crucial to ensure that the new functional food products are well accepted by the consumers. The aim of this study was to assess the consumer's overall product acceptance, product attributes, and willingness to buy the mango fruit leather at the pre-determined recommended price in the Central Zone.

### Methodology

Successful development of a new product requires a correct sensory evaluation, a thorough understanding in the consumer's acceptance criteria (Moskowitz and Hartmann 2008; Guine 2012) and the degree of fit between the new product and consumer needs (Grunert et al. 1997). This study adopted a cross-sectional, quantitative approach. A structured questionnaire was developed to capture information on the consumer's overall acceptance, product attributes and willingness to buy at the pre-determined recommended price of the mango fruit leather. A total of 400 consumers were randomly selected to participate in the survey based on a convenient sampling strategy. This

approach provided benefits in terms of cost, convenience and time. The 400 respondents were sufficient to represent the population in the Central Zone based on the sampling suggested by Krecjie and Morgan (1974). The Central Zone was selected based on recommendations from Kotler and Keller (2006). The marketers must identified three parts in a sequence of phases to gain market access. Phase one was choosing the value which consists of customers segmentation, targeting and positioning. For example, in the case of functional food products, consumers who live in the rural areas might not be familiar with the product. Therefore, this study was conducted at selected hypermarkets/supermarkets located in the Central Zone where majority of consumers show high familiarity of the product. A total of 400 self-administered, structured questionnaires were distributed to the respondents at selected hypermarkets/supermarkets. A 100% response rate was thus anticipated in the survey. The respondents were asked to rate against each product attribute i.e. colour (Jessica 2008), size (Raziah 1997), taste and overall product acceptance (Rosniyana 2007). Finally, they were asked to indicate willingness to buy the mango fruit leather if it was made available in the markets.

The data collected were subsequently transferred to IBM-SPSS Version 23 for data cleaning and analysis. First, descriptive analysis was performed to profile the respondent's background, consumer's overall product acceptance, product attributes and willingness to buy. Then, Pearson Chi-Square analysis was conducted to investigate any significant relationship between the consumer's overall product acceptance and the willingness to buy while Spearman Rho test was used to investigate the quality of relationship between the variables. Finally, a Spearman Rank correlation coefficient was performed to assess the linear association between the consumer's overall product acceptance and willingness to buy the mango fruit leather.

## Results and discussions

### *Demographic profile*

Table 1 shows the demographic profile of respondents who participated in the survey. More than half of the respondents were 40 years old and above (83.6%). Majority of the respondents were female (72.3%) and Malay represented the largest ethnic group participating in this study. Majority of respondents held a certificate, diploma or degree, followed by those who completed secondary education. Finally, the highest percentage of respondents who participated in the survey earned more than RM2,000 per month.

### *Consumer's overall product acceptance, product attributes and willingness to buy*

Table 2 shows the descriptive statistics of consumer's overall product acceptance, product attributes and willingness to buy

Table 1. Demographic profile of respondents (n = 400)

Profile	Percentage
Age (years old)	
20 years old and below	4.5
21 – 30 years old	29.0
31 – 40 years old	32.8
41 – 50 years old	17.3
Above 50 years old	16.4
Gender	
Male	27.8
Female	72.3
Ethnicity	
Malay	60.0
Chinese	27.8
Indian	10.5
Others	1.8
Education	
Master's/PhD	6.3
Certificate/Diploma/Degree	48.5
Secondary school	42.5
Primary school	1.0
Did not receive formal education	1.8
Income group (RM/month)	
RM1,500 – RM2,000	11.8
RM2,001 – RM3,000	38.2
RM3,001 – RM4,000	17.5
>RM4,001	32.6

Table 2. Product attributes, consumer's overall acceptance and willingness to buy (n = 400)

Variable	%	Mean	SD
Product attributes			
Taste	90.0	3.36	0.686
Colour	90.8	3.32	0.659
Texture	89.5	3.30	0.692
Aroma	83.1	3.20	0.762
Design and size	87.8	3.28	0.705
Overall acceptance	93.0	3.43	0.629
Willingness to buy	86.8		
Recommended price (RM4.00/25 g)	69.0		

the mango fruit leather. More than 90% of the consumers accepted the product as indicated by the overall product acceptance. In addition, taste and colour recorded the highest percentage for product attributes. Next, almost 87% indicated their willingness to buy when the mango fruit leather becomes available in the market. Finally, almost 70% agreed with the recommended price of RM4.00/25 g.

#### **Consumer's overall product acceptance and willingness to buy**

Table 3 shows the results derived from the Pearson Chi-Square analysis. Based on the analysis, this study found that there was a statistically significant association between consumer's overall product acceptance and willingness to buy ( $X^2 = 104.750$ ,  $p < 0.005$ ).

Table 4, on the other hand, presents the results derived from the Spearman's Rho test. Based on Table 4, the study found a statistically significant positive relationship between consumer's overall product acceptance and willingness to buy. In other words, changes in the consumer's overall product acceptance would change the willingness to buy in the same direction and *vice versa*.

Table 3. Pearson Chi-Square test for consumer's overall product acceptance and willingness to buy

Pearson Chi-square Test	Willingness to buy (%)
Value	104.750 <sup>a</sup>
df	3
Asymptotic Significance (2-sided)	.000
	( $X^2 = 104.750^a$ , $df = 3$ , $p < 0.005$ )

#### **Socio-economic factors and willingness to buy**

This study also identified the socio-economic factors that influenced the willingness to buy among the consumers. Based on Chi-Square analysis, ethnicity and income group ( $X^2 = 9.737$ ,  $p < 0.005$ ) were the two socio-economic factors (Table 5) that were related with the willingness to buy. Based on Table 1, the Malay recorded the highest percentage (60%), followed by Chinese (28%), Indian and others (12%). This finding suggests that ethnicity is a critical factor to be considered in marketing the mango fruit leather.

#### **Willingness to buy and ethnicity**

Table 6 shows the results derived from the Chi-Square test for willingness to buy and ethnicity. There was a statistically significant relationship between willingness to buy and ethnicity, especially among the Chinese ( $X^2 = 4.759$ ,  $p < 0.005$ ). However, no significant relationship was observed among the Malays and Indian/Others for the same variable.

#### **Willingness to buy and income group**

Table 7 shows the results derived from the Chi-Square test for willingness to buy and income group. Like ethnicity, income group was significantly related to willingness to buy. Further investigation revealed a statistically significant relationship between willingness to buy and income group i.e. RM2,001 – RM3,000 ( $X^2 = 2.95$ ,  $p < 0.005$ ) and RM3,001 – RM4,000 ( $X^2 = 3.498$ ,  $p < 0.005$ ). However, there was no significant

Table 4. Spearman's Rho Test for consumer's overall product acceptance and willingness to buy

Spearman's Rho		Correlations		
			Overall product acceptance	Willingness to buy
Overall acceptance	Correlation coefficient	1.000		.433**
	Sig.(2-tailed)			.000
	N	400		400
Willingness to purchase	Correlation coefficient	.433***		1.000
	Sig.(2-tailed)	.000		
	N	400		400

Note: \*\*Correlation is significant at the 0.01 level (2-tailed).

Table 5. Results of Chi-Square Test for willingness to buy and income group

Chi-square Test	Income Group
Pearson Chi-Square Test	
Value	9.737
df	3
Asymptotic Significance (2-sided)	.000
( $X^2 = 9.737^a$ , $df = 3$ , $p < 0.005$ )	

Table 6. Results of Chi-Square Test for willingness to buy and ethnicity

Chi-Square Test	Willingness to buy		
	Malay	Chinese	Indian/Others
Pearson Chi-square Test			
Value	2.815	4.759	2.369
df	2	1	1
Asymptotic Significance (2-sided)	.245	.024	.306
No relationship ( $X^2 = 4.759^a$ , $df = 3$ , $p < 0.005$ )			

Table 7. Results of Chi-Square Test for willingness to buy and income group

Chi-Square Test	Income group			
Income Group	RM1,500 – RM2,000	RM2,001 – RM3,000	RM3,001 – RM4,000	>RM4,000
Pearson Chi-square Test				
Value	1.642	2.958	3.498	2.826
df	4	1	1	1
Asymptotic Significance (2-sided)	.440	.050	.041	.075
No relationship ( $X^2 = 2.95^a$ , $df = 1$ , $p < 0.005$ ) ( $X^2 = 3.498^a$ , $df = 1$ , $p < 0.005$ )				

relationship observed among those in the income groups of RM1,500 – RM2,000 and >RM4,000 in willingness to buy.

Based on the findings, mango fruit leather recorded high percentages of consumer's overall product acceptance, product attributes and willingness to buy at recommended price of RM4.00/25 g. This new food product has a strong potential to be marketed as the consumer's overall product acceptance was significantly and positively related with the willingness to buy. These findings give indication to the food industry players on the market readiness of new food product prior to market penetration. The industry players may subsequently plan their production capacities for the mango fruit leather prior to bringing it into the market. When the industry understands the consumer needs and their evaluations on the product attributes, the production planning becomes more effective. This helps the industry players in resource allocation strategies, thereby minimising production wastes. With the right pair of product attributes and recommended price, the rate of success for the new product to penetrate the food market is high.

Apart from that, this study also observed significant roles of ethnicity and income group in determining the willingness to buy. Based on the findings, Chinese respondents indicated significant relationship with their willingness to buy. In China, mango has a long-standing history and tradition dated back in the 20<sup>th</sup> century when mango became famous not for its nutritional benefits but as a symbol of love and goodwill. Surprisingly, mango developed a peculiar relationship in the Chinese society during an 18-month-long episode of Cultural Revolution which took place in 1968 helmed by Chairman Mao (BBC 2016; Volodzko 2016). It also became a symbol of reconciliation and love when Pakistan's foreign minister presented a basket of mangoes to Chairman Mao during his visit to Beijing in 2013 (Moore 2013).

During this era, mangoes were widely found across the country in many forms, including mango-brand cigarettes and fruit juices (Volodzko 2016). This fact reinforces our understanding in the century-long relationship that prevails between mangoes and Chinese people.

In addition, respondents in the income groups of RM2,001 – RM3,000 and RM3,001 – RM4,000 indicated the same relationship with their willingness to buy. As people realised the nutritional benefits of the mango fruit leather, consumers from middle and high-income groups showed tendency to buy the food products mainly for their health. In Malaysia, the citizens are becoming more aware of the importance of healthy living. In view of rising medical bills in Malaysia, the demand for functional food has gradually grown in tandem with the increase awareness in health (Nor Amna A'liah et al. 2016). More Malaysians are becoming health conscious which subsequently leads to the increase purchase of functional food (Stanton et al. 2011). Apart from that, mango pricing strategy is highly vulnerable to strong fruit market turbulence. Price of mango also receives upward pressure due to market fundamentals and non-economic factors (e.g. temperature, weather and soil). Therefore, the mango fruit leather is highly marketable among the consumers who belong to the middle and high-income groups.

These findings provide hints to the food industry players to draw their marketing strategies by placing heavier emphasis on these groups. The rate of success of mango fruit leather would be higher when it penetrated the right market segments. The above information is useful for product developers or industry takers for new product development (Li et al. 2015). The consumer's responsiveness on the attributes of new food products are useful to formulate acceptable products (Li et al. 2015) as these attributes cannot be changed or experimentally manipulated without changing the physical characteristics

of the product itself (Olson and Jacoby 1972). Almost 13 studies recorded that consumer's overall acceptance of nutritious food is largely a function of sensory preference when sensory attributes are used as key quality parameters (Mogendi et al. 2016).

### Conclusion and recommendations

The goal of this study was to evaluate consumer's overall product acceptance, product attributes and willingness to buy the mango fruit leather, which is developed by MARDI, at pre-determined recommended price of RM4.00/25 g. The mango fruit leather showed high percentages in consumer's overall product acceptance, product attributes and willingness to buy. Next, there was a significant relationship between the consumer's overall product acceptance and willingness to buy the mango fruit leather. On the other hand, ethnicity and income group were the two critical socio-economic factors that influenced their willingness to buy the mango fruit leather. This study complements the information on consumer's evaluation towards assisting the potential determination of new and future product development as well as recommending suitable appropriate marketing strategies. As the study only involved the consumers in the Central Zone, the understanding of consumer's overall product acceptance, product attributes, willingness to buy and pricing mechanism should also be assessed in other zones of Malaysia for a comprehensive consumer's evaluation in the future.

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## **Abstrak**

Industri makanan moden Malaysia mengiktiraf peningkatan peranan pembangunan produk makanan baru (NFPD). Walau bagaimanapun, pembangunan produk makanan baru cenderung menunjukkan kebarangkalian kegagalan yang tinggi. NFPD kurang memberi penekanan kepada pentingnya penilaian pengguna, dengan itu keadaan ini menyebabkan kebarangkalian kegagalan yang tinggi sebelum memasuki pasaran. Penilaian pengguna adalah penting untuk mengurangkan insiden kegagalan produk di pasaran. Kajian ini melaporkan penilaian pengguna terhadap produk makanan baru iaitu gegelung mangga yang dibangunkan oleh MARDI dengan mengkaji penerimaan keseluruhan produk, atribut produk dan kesanggupan pengguna untuk membayar pada harga yang dicadangkan. Borang soal selidik telah diedarkan kepada 400 pengguna di pasar raya terpilih di Zon Tengah. Kajian menunjukkan peratusan yang tinggi terhadap penerimaan keseluruhan produk gegelung mangga (93%) dan juga atribut produk seperti warna (91%), tekstur (90%), aroma (83%) dan saiz (88%). Selain itu, 87% pengguna menyatakan sanggup membeli gegelung mangga dan 70% bersetuju untuk membeli pada harga yang dicadangkan iaitu RM4.00/25 g. Kajian juga mendapati terdapat perhubungan yang positif antara penerimaan keseluruhan produk gegelung mangga dengan kesanggupan pengguna untuk membeli. Etnik dan kumpulan pendapatan pengguna merupakan dua faktor pemboleh ubah sosioekonomi yang mempengaruhi kesanggupan untuk membeli. Keputusan kajian ini penting kepada pemain industri makanan untuk merangka strategi pemasaran yang berkesan bagi produk makanan baru dan mengurangkan kebarangkalian kegagalan produk di pasaran.