

Consumer-Oriented Development of a Healthy Fruit and Nougat Snack Product (FRUGATO) Using Quality Function Deployment (QFD)

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Abstrak

Perubahan gaya hidup konsumen telah mendorong pengembangan produk camilan yang tidak hanya menawarkan karakteristik sensori yang disukai, tetapi juga memberikan nilai tambah bagi kesehatan. Oleh karena itu, pengembangan produk perlu mempertimbangkan ekspektasi konsumen dan menerjemahkannya ke dalam spesifikasi produk yang sesuai. Penelitian ini berfokus pada pengembangan Fruit and Nougat (FRUGATO), sebuah produk camilan sehat, dengan menerapkan pendekatan Quality Function Deployment (QFD) untuk mengidentifikasi preferensi konsumen dan memprioritaskan kebutuhan teknis. Data dikumpulkan melalui kuesioner yang disebarluaskan kepada 50 responden dan dianalisis melalui tiga tahap utama, yaitu penentuan kebutuhan konsumen, evaluasi tingkat kepentingan setiap atribut, dan analisis kompetitif. Hasil penelitian menunjukkan bahwa konsumen mempertimbangkan lima atribut utama dalam memilih produk, yaitu kualitas, tekstur, bahan baku, tanggal kedaluwarsa, dan harga, dengan skor tingkat kepentingan masing-masing sebesar 4,64; 4,62; 4,54; 4,54; dan 4,46. Penilaian kompetitif menunjukkan bahwa FRUGATO memperoleh skor evaluasi pelanggan sebesar 4,66 untuk harga, 4,74 untuk bahan baku, 4,68 untuk tanggal kedaluwarsa, 4,76 untuk tekstur, dan 4,76 untuk kualitas, yang menunjukkan kinerja lebih baik dibandingkan produk pembeding. Berdasarkan analisis House of Quality, aspek teknis dengan prioritas tertinggi adalah kualitas sesuai standar industri (41,58), harga yang terjangkau (40,14), dan konsistensi yang stabil (13,86). Hasil penelitian ini menegaskan bahwa QFD dapat diterapkan secara efektif sebagai alat pengembangan produk untuk menyelaraskan spesifikasi teknis dengan kebutuhan konsumen serta memperkuat daya saing FRUGATO di pasar camilan sehat.

Kata Kunci Preferensi Konsumen, Camilan Sehat, House of Quality, Pengembangan Produk, Voice of Customer

Abstract

Changes in consumer lifestyles have encouraged the development of snack products that offer both desirable sensory characteristics and added health value. Therefore, product development needs to consider consumer expectations and translate them into appropriate product specifications. This study focuses on the development of Fruit and Nougat (FRUGATO), a healthy snack product, by applying the Quality Function Deployment (QFD) approach to identify consumer preferences and prioritize technical requirements. Data were collected through questionnaires distributed to 50 respondents and analyzed using three main stages: determining consumer needs, evaluating the importance level of each attribute, and conducting competitive analysis. The findings indicate that consumers consider five key attributes in selecting the product, including quality, texture, raw materials, expiration date, and price, with importance scores of 4.64, 4.62, 4.54, 4.54, and 4.46, respectively. The competitive assessment demonstrates that FRUGATO obtained customer evaluation scores of 4.66 for price, 4.74 for raw materials, 4.68 for expiration date, 4.76 for texture, and 4.76 for quality, showing better performance compared with the benchmark product. Based on the House of Quality analysis, the most prioritized technical aspects were industry-standard quality (41.58), affordable pricing (40.14), and stable consistency (13.86). The results confirm that QFD can be effectively applied as a product development tool to align technical specifications with consumer needs and strengthen the competitiveness of FRUGATO in the healthy snack market.

Keywords: Consumer Preferences, Healthy Snacks, House Of Quality, Product Development, Voice Of Customer

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1. Introduction

The snack food industry is currently experiencing a significant paradigm shift, driven by growing consumer awareness of the relationship between dietary patterns and health outcomes (Žurek et al., 2026). As highlighted by Žurek et al. (2026), functional foods have gained particular importance as they provide additional health benefits that support well-being and meet the demands of consumers aiming to improve their quality of life through conscious dietary choices. Changes in consumer preferences for snack products indicate an increasing demand for products that are not only palatable but also offer functional health benefits (Herdhiansyah et al., 2025). Food products based on natural ingredients are increasingly considered safer and healthier alternatives to conventional synthetic products (Ruiz-Capillas et al., 2021). Abraham et al. (2025) demonstrated that product characteristics, particularly sensory attributes, remain dominant factors influencing the acceptance of healthy foods and beverages. Furthermore, Hou et al. (2025) emphasized that the failure of functional food products in the market is often caused by a mismatch between product attributes and consumer preferences. This trend is reinforced by industry projections showing that the global healthy snacks market, valued at USD 106.54 billion in 2024, is expected to nearly double to USD 207.8 billion by 2035 (Vantage Market Research, 2025), underscoring the urgency for systematic, consumer-driven product development approaches such as QFD to help small and medium-sized producers compete in this rapidly expanding market.

The development of healthy snack products requires a systematic approach to ensure that consumer needs are accommodated from the early stages of product design (Jreissat & Makatsoris, 2022; Kar & Rai, 2025). The Quality Function Deployment (QFD) method is applied to translate the voice of customer into technical product specifications through the House of Quality matrix (Indraswari et al., 2024; Rengganis et al., 2025). Abraham et al. (2025) showed that QFD is effective in developing matcha beverage products by improving the alignment between product attributes and consumer requirements. In addition, (Alatas et al., 2025) reported that QFD significantly enhances the quality of cup holder products through systematic mapping of user needs.

In Indonesia, the application of QFD in local food products has demonstrated positive outcomes in identifying priority consumer attributes (Nisha & Ravi, 2025). Nalhadi et al. (2022) proved that QFD is effective in designing traditional cake packaging that meets market needs and enhances product attractiveness. Other studies have found that integrating QFD with green product concepts can improve the competitiveness of traditional foods in increasingly competitive markets (Daultani et al., 2025; Shidik et al., 2024). These findings confirm that

QFD is not only relevant for modern products but also for food products rooted in local wisdom.

The integration of QFD in product development also supports the creation of innovations based on quantitatively measured and customer-driven preferences (Sari et al., 2025). Mubarak & Sasongko (2023) demonstrated that the implementation of QFD in culinary MSMEs improves product innovation quality and assists business owners in determining product improvement priorities. QFD has also been proven to systematically enhance product packaging design (Bhanu & Kumar, 2024; Hidayat et al., 2025).

Previous studies indicate that QFD remains highly relevant in the modern food industry, as it effectively integrates consumer needs with technical production constraints (Amalia et al., 2024). Thomas et al. (2021) menyatakan bahwa QFD stated that QFD supports a consumer-centric food development approach by positioning consumers at the core of decision-making in product design. Ernawati et al. (2023) emphasized that consumer-based product development requires a sustainable closed-loop system to ensure long-term competitiveness of innovation outcomes. Through QFD, products can therefore play a strategic role in bridging market demands and producers' technical capabilities.

Consumer-based product development has been proven to significantly increase market adoption potential. Therefore, this study applies the QFD method to identify consumer needs and determine priority technical specifications in the development of a healthy snack product based on fruit and nougat. The findings of this study are expected to provide practical contributions to improving product quality and assisting food industry practitioners in designing products that better align with market preferences. In addition, this research is expected to enrich the scientific literature on the application of QFD in healthy snack product development in Indonesia.

2. Research Methods

This research applied a quantitative approach to develop the Fruit and Nougat (FRUGATO) healthy snack product using the Quality Function Deployment (QFD) method. The study was conducted during August 2026 as part of the FRUGATO product development activity in Surabaya. The respondents consisted of 50 potential consumers of healthy snack products aged 17–35 years, while the research object was the FRUGATO product. The research stages included identifying consumer needs, collecting data through structured questionnaires, processing and analyzing data, developing the House of Quality (HOQ) matrix, and determining product development priorities using the QFD approach.

Data collection was carried out using primary data obtained through structured questionnaires, which were designed in three stages, as follows:

1. Phase 1 questionnaire, aimed at identifying the Voice of Customer (VoC) and product attributes considered important by consumers for the FRUGATO product.
2. Phase 2 questionnaire, aimed at measuring the level of importance of each product attribute using a rating scale to obtain the Importance Rating (IR) values.
3. Phase 3 questionnaire, aimed at comparing the performance of the FRUGATO product with competing products through Competitive Customer Evaluation (CCE).

The questionnaire instrument was evaluated through validity and reliability tests:

1. Validity test, conducted using the Pearson Product Moment correlation. An item was considered valid if the r-count value exceeded the r-table value at a 5% significance level with $df = n - 2$ (Puspasari & Puspita, 2022). For 50 respondents ($df = 48$), the r-table value was 0.279.
2. Reliability test, conducted using Cronbach's Alpha coefficient. The questionnaire was considered reliable when the Cronbach's Alpha value exceeded 0.70 (Utami, 2023).

Data analysis was conducted using the Quality Function Deployment (QFD) approach with the following stages:

1. Identifying customer needs (Voice of Customer) based on the results of the Phase 1 questionnaire.
2. Calculating the Importance Rating (IR) based on the results of the Phase 2 questionnaire.
3. Determining technical requirements that are relevant to customer needs.
4. Establishing the relationships between customer requirements and technical requirements in the House of Quality (HOQ) matrix.
5. Conducting competitive analysis based on Competitive Customer Evaluation (CCE) values.
6. Determining technical targets and product development priorities based on weighting and the results of the HOQ analysis.

The overall research procedure is presented in the form of a flowchart illustrating the main stages of the study, as shown in Figure 1. Flowchart.

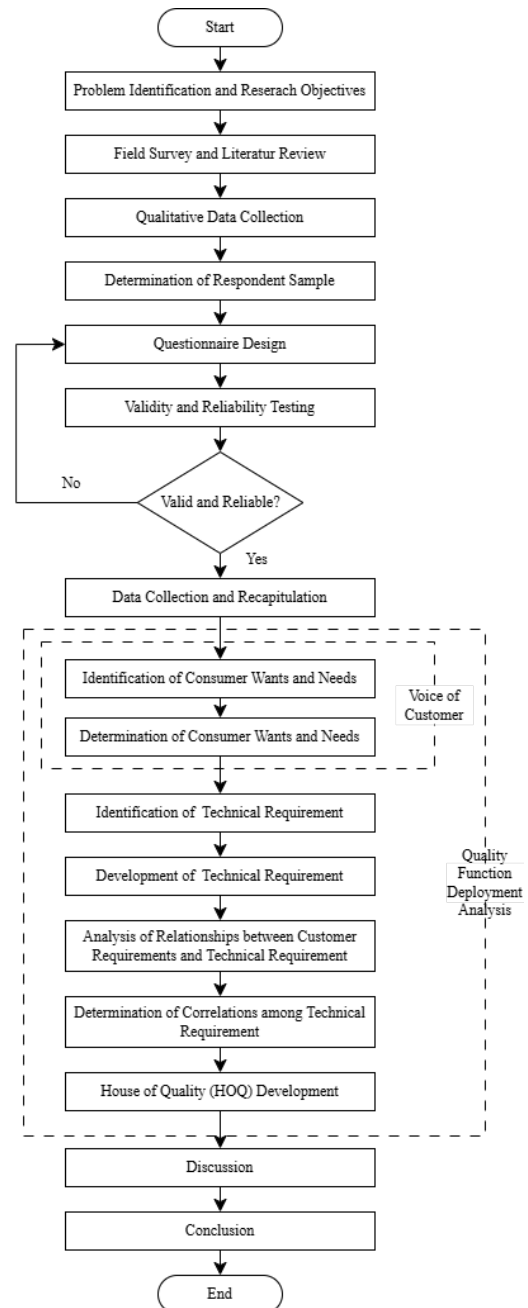


Figure 1: Flowchart

3. Results and Discussion

At this stage, primary data were collected using a structured questionnaire designed to obtain demographic information and consumer evaluations related to FRUGATO product attributes. The questionnaire was distributed to selected participants who met the predefined criteria. The collected data were then used for consumer needs identification, importance evaluation, competitive assessment, and further QFD analysis.

3.1 Customer Needs Identification

The data collection method employed in this study was a questionnaire distributed to 50 respondents. The questionnaire collected demographic information and consumer evaluations of FRUGATO product attributes

as primary data obtained directly from respondents. The respondents belonged to the young adult age group, ranging from 17 to 35 years old. In terms of gender distribution, the majority of respondents were male (58%), while female respondents accounted for 42%. The questionnaire was designed into three phases as follows:

a. Questionnaire Phase 1

The first-stage questionnaire was designed to identify consumer needs and preferences regarding the healthy snack product Fruit and Nougat (FRUGATO). This phase aimed to capture key product attributes considered important by potential consumers. The recapitulation of the Phase 1 questionnaire results is presented in Table 1.

Table 1: Recapitulation of Phase 1 Questionnaire Results

No.	Attribute	Frequency
1	Price	32
2	Raw Materials	30
3	Expiration Date	29
4	Texture	27
5	Quality	27
6	Taste	20
7	Appearance	19
8	Durability	11
9	Packaging Design	15
10	Packaging	15
11	Size	3
12	Bonus	2
13	Promotion Technique	2
14	Topping	2
15	Promotion	3
16	Flavor Innovation	2
17	Trial Experience	2
18	Nutritional Content	2
19	Service	5
20	Purchase Intention	2
Total		250

Based on the responses collected from 50 participants, a total of 20 consumer-desired attributes were identified with varying frequencies of occurrence. The most frequently mentioned attributes included price (32 respondents), raw materials (30 respondents), expiration date (29 respondents), texture (27 respondents), and quality (27 respondents). Other attributes included taste (20 respondents), appearance (19 respondents), packaging design (15 respondents), packaging (15 respondents), durability (11 respondents), and service (5 respondents). Meanwhile, attributes such as size (3 respondents), promotion (3 respondents), bonus (2 respondents), promotion technique (2 respondents), topping (2 respondents), flavor innovation (2 respondents), trial experience (2 respondents), nutritional content (2 respondents), and purchase intention (2 respondents) were mentioned less frequently. Based on the frequency of occurrence, the five highest-ranked customer attributes were selected as the main customer

requirements for further QFD analysis. These attributes consisted of price, raw materials, expiration date, texture, and quality.

b. Questionnaire Phase 2

The second-stage questionnaire aimed to measure the importance level of the selected FRUGATO product attributes based on consumer preferences. This phase was conducted to determine the Importance Rating (IR) values of each customer requirement, which were used as inputs for further QFD analysis. The recapitulation of the Phase 2 questionnaire results is presented in the following section.

Table 2: Phase 2 Questionnaire Recapitulation (Price)

Description	Scale	Frequency	Score
Very Unimportant	1	0	0
Unimportant	2	0	0
Moderately Important	3	4	12
Important	4	19	76
Very Important	5	27	135
Total		50	223
Importance Rating (IR)			4,46

Table 3: Phase 2 Questionnaire Recapitulation (Raw Material)

Description	Scale	Frequency	Score
Very Unimportant	1	0	0
Unimportant	2	0	0
Moderately Important	3	1	3
Important	4	21	84
Very Important	5	28	140
Total		50	227
Importance Rating (IR)			4,54

Table 4: Phase 2 Questionnaire Recapitulation (Expiration Date)

Description	Scale	Frequency	Score
Very Unimportant	1	0	0
Unimportant	2	0	0
Moderately Important	3	1	3
Important	4	21	84
Very Important	5	28	140
Total		50	227
Importance Rating (IR)			4,54

Table 5: Phase 2 Questionnaire Recapitulation (Texture)

Description	Scale	Frequency	Score
Very Unimportant	1	0	0
Unimportant	2	0	0
Moderately Important	3	1	3
Important	4	17	68
Very Important	5	32	160
Total		50	231
Importance Rating (IR)			4,62

Table 6: Phase 2 Questionnaire Recapitulation (Quality)

Description	Scale	Frequency	Score
Very Unimportant	1	0	0
Unimportant	2	0	0
Moderately Important	3	3	9
Important	4	12	48
Very Important	5	35	175
Total		50	232
Importance Rating (IR)			4,64

The Importance Rating (IR) represents the level of importance of each product attribute based on consumer preferences. A higher IR value indicates a greater level of consumer interest in the corresponding attribute. The IR values were calculated using Microsoft Excel by dividing the total weighted score obtained from the questionnaire by the total number of respondents. Based on the questionnaire results, the importance ratings of the key attributes were quality (4.64), texture (4.62), raw materials (4.54), expiration date (4.54), and price (4.46). These results indicate that quality was considered the most important attribute by consumers, followed by texture. Meanwhile, price obtained the lowest IR value among the five attributes, although it remained an important consideration in the development of the Fruit and Nougat (FRUGATO) product.

c. Questionnaire Phase 3

The third-stage questionnaire aimed to evaluate consumer perceptions of the FRUGATO product compared with existing competing products. This phase focused on assessing the performance of FRUGATO and competing products based on selected customer requirements through Competitive Customer Evaluation (CCE).

Table 7: Phase 3 Questionnaire Recapitulation (Price)

Description	Weight	Developed Product	Score	Competing Product	Score
Strongly Disagree	1	0	0	0	0
Disagree	2	0	0	2	4
Moderately Agree	3	2	6	8	24
Agree	4	13	52	30	120
Strongly Agree	5	35	175	10	50
Total		50	233	50	198

Table 8: Phase 3 Questionnaire Recapitulation (Raw Materials)

Description	Weight	Developed Product	Score	Competing Product	Score
Strongly Disagree	1	0	0	0	0
Disagree	2	0	0	2	4
Moderately Agree	3	0	0	9	27
Agree	4	13	52	29	116
Strongly Agree	5	37	185	10	50
Total		50	237	50	197

Table 9: Phase 3 Questionnaire Recapitulation (Expiration Date)

Description	Weight	Developed Product	Score	Competing Product	Score
Strongly Disagree	1	0	0	0	0
Disagree	2	0	0	1	2

Moderately Agree	3	0	0	14	42
Agree	4	16	64	27	108
Strongly Agree	5	34	170	8	40
Total		50	234	50	192

Table 10: Phase 2 Questionnaire Recapitulation (Texture)

Description	Weight	Developed Product	Score	Competing Product	Score
Strongly Disagree	1	0	0	0	0
Disagree	2	0	0	5	10
Moderately Agree	3	1	3	15	45
Agree	4	10	40	22	88
Strongly Agree	5	39	195	8	40
Total		50	238	50	183

Table 11: Phase 2 Questionnaire Recapitulation (Quality)

Description	Weight	Developed Product	Score	Competing Product	Score
Strongly Disagree	1	0	0	0	0
Disagree	2	0	0	2	4
Moderately Agree	3	1	3	13	39
Agree	4	10	40	25	100
Strongly Agree	5	39	195	10	50
Total		50	238	50	193

Table 12: Competitive Customer Evaluation (CCE) Results

No.	Attribute	Developed Product (CCE)	Competing Product (CCE)
1	Price	4,66	3,96
2	Raw Materials	4,74	3,94
3	Expiration Date	4,68	3,66
4	Texture	4,76	3,66
5	Quality	4,76	3,86

Competitive assessment illustrates the position of the developed product relative to competing products based on consumer perceptions. The Competitive Customer Evaluation (CCE) value was calculated using Microsoft Excel by dividing the total score by the number of respondents.

Based on the evaluation results, the developed healthy snack product Fruit and Nougat (FRUGATO) achieved CCE values of 4.66 for price, 4.74 for raw materials, 4.68 for expiration date, 4.76 for texture, and 4.76 for quality. In comparison, the competing product recorded lower CCE values of 3.96, 3.94, 3.66, 3.66, and 3.86 for the respective attributes. These results indicate that the FRUGATO product outperforms the competing product across all evaluated attributes. The highest CCE values of FRUGATO were obtained for texture and quality (4.76), indicating that these attributes provide the

strongest consumer-perceived performance, followed by raw materials (4.74), expiration date (4.68), and price (4.66). Overall, the higher CCE values of FRUGATO demonstrate its stronger competitive position compared with the competing product and indicate good potential for further product development.

3.2 Instrument Testing

Before further analysis, the questionnaire instruments used in this study were evaluated through validity and reliability tests to ensure that the collected data were suitable for analysis. The validity test was conducted using the Pearson Product Moment correlation by comparing the r-count value of each item with the r-table value. Meanwhile, the reliability test was evaluated using the Cronbach's Alpha coefficient.

An item was considered valid if the r-count value was greater than the r-table value at a 5% significance level. For 50 respondents, the degree of freedom (df) was 48, resulting in an r-table value of 0.279.

Table 13: Validity Test Results – Phase 2 (Importance Rating)

No.	Item / Attribute	r-count	r-table	Result
1	Price	0,742	0.279	Valid
2	Raw Materials	0,807	0.279	Valid
3	Expiration Date	0,807	0.279	Valid
4	Texture	0,747	0.279	Valid
5	Quality	0,534	0.279	Valid

Table 14: Validity Test Results – Phase 3 (Competitive Customer Evaluation)

No.	Item / Attribute	r-count	r-table	Result
1	Price	0,560	0.279	Valid
2	Raw Materials	0,801	0.279	Valid
3	Expiration Date	0,849	0.279	Valid
4	Texture	0,730	0.279	Valid
5	Quality	0,630	0.279	Valid

Based on the Cronbach's Alpha results, the questionnaire instruments used in Phase 2 and Phase 3 were considered reliable because the obtained values exceeded the minimum acceptance value of 0.70. This indicates that the instruments were consistent.

Table 15: Reliability Test Results (Cronbach's Alpha)

Questionnaire Phase	N of Items	Cronbach's Alpha	Result
Phase 2 (Importance Rating)	5	0,7705	Reliable
Phase 3 (Competitive Customer Evaluation)	5	0,7469	Reliable

3.3 House of Quality (HOQ) Matrix Development

The House of Quality (HOQ) is a structured representation of the voice of customer (VoC) that must be considered throughout the product development process. The VoC serves as a systematic approach applied in product design, production processes, and service delivery to ensure that customer requirements are effectively fulfilled.

The HOQ serves as a fundamental tool in product development, as it integrates several key elements, including customer requirements (the *what's* or voice of customer), technical requirements (the *how's*), the relationship matrix, competitive assessment, and importance ratings. These components collectively enable the translation of customer needs into measurable technical specifications.

The stages involved in constructing the HOQ matrix are outlined as follows:

a. Voice of Customer (VoC)

The voice of customer (VoC) plays a crucial role in the early stages of product development prior to product design and mass production. In the development of the healthy snack product Fruit and Nougat (FRUGATO), the VoC also contributes to achieving company objectives through direct market research.

Based on the questionnaire results, five primary customer requirements were identified as the most critical attributes influencing consumer preferences for the FRUGATO product, namely:

- Price
- Raw Materials
- Expiration Date
- Texture
- Quality

b. Determination of Importance Rating

The Importance Rating (IR) is a metric used to represent the level of importance of each Voice of Customer (VoC) attribute, obtained through the analysis of questionnaire responses collected from consumers. Based on the calculation results from the second-stage questionnaire, the Importance Rating values are presented in Table 13.

Table 16: Importance Rating

Customer Requirement	Importance Rating
Price	4,46
Raw Materials	4,54
Expiration Date	4,54
Texture	4,62
Quality	4,64

c. Determination of Technical Requirements

At this stage, customer requirements are identified and translated into measurable technical requirements to enable direct product development. The resulting technical requirements for the FRUGATO product are presented in Table 14.

Table 17: Technical Requirements

No.	Customer Requirement	Technical Requirement
1	Price	Affordable pricing
2	Raw Materials	High-quality ingredients
3	Expiration Date	Stability testing
4	Texture	Stable consistency

5	Quality	Industry-standard quality
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d. Relationship Between Customer Requirements and Technical Requirements

This stage identifies the relationship between customer requirements and technical requirements. The relationship matrix illustrates the extent to which each customer need is supported by the defined technical specifications. The results are shown in Table 15.

Table 18: Relationship Between Customer Requirements and Technical Requirements

No.	Customer Requirement	Technical Requirement	Relationship
1	Price	Affordable pricing	Strong
2	Raw Materials	High-quality ingredients	Medium
3	Expiration Date	Stability testing	Strong
4	Texture	Stable consistency	Medium
5	Quality	Industry-standard quality	Strong

e. Target Determination (How Much)

Based on the established technical requirements, specific targets were defined to guide the development of the FRUGATO product. These targets represent measurable objectives aligned with both technical feasibility and customer expectations. The defined targets are presented in Table 16.

Table 19: Technical Targets

Technical Requirement	Target
Affordable pricing	IDR 15,000 – IDR 18,000
High-quality ingredients	Use of premium ingredients
Stability testing	Adequate product shelf life
Stable consistency	Consistent taste and texture
Industry-standard quality	Halal certification & BPOM approval

f. Stages of HOQ Construction

The House of Quality (HOQ) matrix for the FRUGATO product was constructed through several systematic stages. The first stage involves the development of the initial correlation matrix, which describes the interrelationships among technical requirements.

• Correlation Matrix 1

No	Customer Requirement	Importance Rating	Affordable Pricing	High-quality ingredients	Stability testing	Stable consistency	Industry-standard quality
			1	2	3	4	5
1	Price	4,46	●				
2	Raw Materials	4,54		○			
3	Expiration Date	4,54					
4	Texture	4,62				○	
5	Quality	4,64					●
Target			IDR 15,000 – IDR 18,000	Use of premium ingredients	Adequate product shelf life	Consistent taste and texture	Halal certification & BPOM approval
Column Weight			40,14	13,62	4,54	13,86	41,58

Figure 2: Correlation Matrix 1

Based on the House of Quality (HOQ) matrix, the relationship between customer requirements and technical requirements in the development of the healthy snack product Fruit and Nougat (FRUGATO) can be identified and prioritized. The Importance Rating (IR) values indicate that quality (4.64) and texture (4.62) are the most important customer requirements, followed by raw materials (4.54), expiration date (4.54), and price (4.46). The HOQ analysis shows that strong relationships are identified between price and affordable pricing, raw materials and high-quality ingredients, as well as quality and industry-standard quality. Meanwhile, expiration date is associated with stability testing, and texture is related to stable consistency. The column weight analysis highlights industry-standard quality (41.58) and affordable pricing (40.14) as the highest technical priorities, followed by stable consistency (13.86), high-quality ingredients (13.62), and stability testing (4.54). These results indicate that maintaining product quality, developing appropriate pricing strategies, and ensuring product consistency are the main technical priorities in fulfilling consumer requirements. Overall, the HOQ matrix provides a structured approach to translating customer needs into technical requirements for FRUGATO product development.

- Correlation Matrix 2

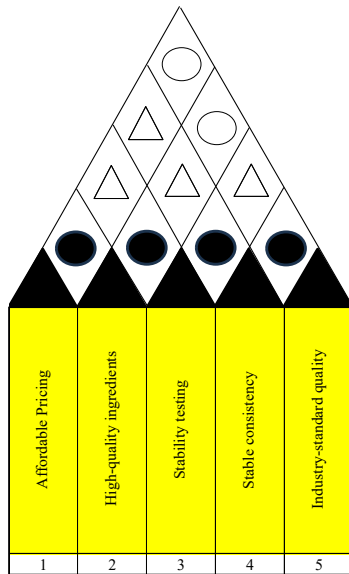


Figure 3: Correlation Matrix 2

Based on the illustration, various relationships between Customer Requirements and Technical Requirements are identified in the product development process of FRUGATO. At the bottom of the diagram, five customer needs are presented, namely affordability, industry standards, stable consistency, stability, and high quality. The upper part of the diagram illustrates the relationships between customer needs and technical aspects of the product, where different symbols such as empty circles, triangles, and filled circles indicate varying levels of relationship strength.

Empty circles represent weak relationships, triangles indicate moderate relationships, and filled circles denote strong relationships. Each customer requirement is linked to multiple technical aspects. For instance, affordability shows a strong relationship with a specific technical factor, while high-quality

ingredients also demonstrate a strong relationship with certain technical specifications. Overall, this diagram facilitates the translation of customer needs into measurable technical specifications, ensuring that the developed FRUGATO product meets consumer expectations while maintaining consistent quality.

- Competitive Technical Assessment Analysis

Evaluation from Consumers					Goals	Sales Point	Improvement Ratio	Row Weight	Action
1	2	3	4	5					
		▲		●	3,7	1,1	0,83	4,07	A
	▲		●		3,7	1	0,81	3,7	C
		▲	●		4,1	1,1	0,90	4,51	A
		▲		●	3,8	1,2	0,82	4,56	A
	▲		●		3,7	1,2	0,80	4,44	A

Figure 4: Competitive Technical Assessment

The company established target goal values for customer requirements to improve the competitive position of the developed FRUGATO product. Based on the evaluation results, the Sales Point values assigned to the Voice of Customer attributes were 1.1 for price, 1.0 for raw materials, 1.1 for expiration date, 1.2 for texture, and 1.2 for quality, indicating that texture and quality were considered important attributes for product improvement.

Based on the calculated row weights, texture obtained the highest value (4.56), followed by expiration date (4.51), quality (4.44), price (4.07), and raw materials (3.70). These results indicate that texture, expiration date, and quality require greater attention in the FRUGATO product development strategy. In terms of development actions, price, expiration date, texture, and quality were assigned as Action A, focusing on direct performance improvement, while raw materials were assigned as Action C, emphasizing the maintenance of existing standards and cost control.

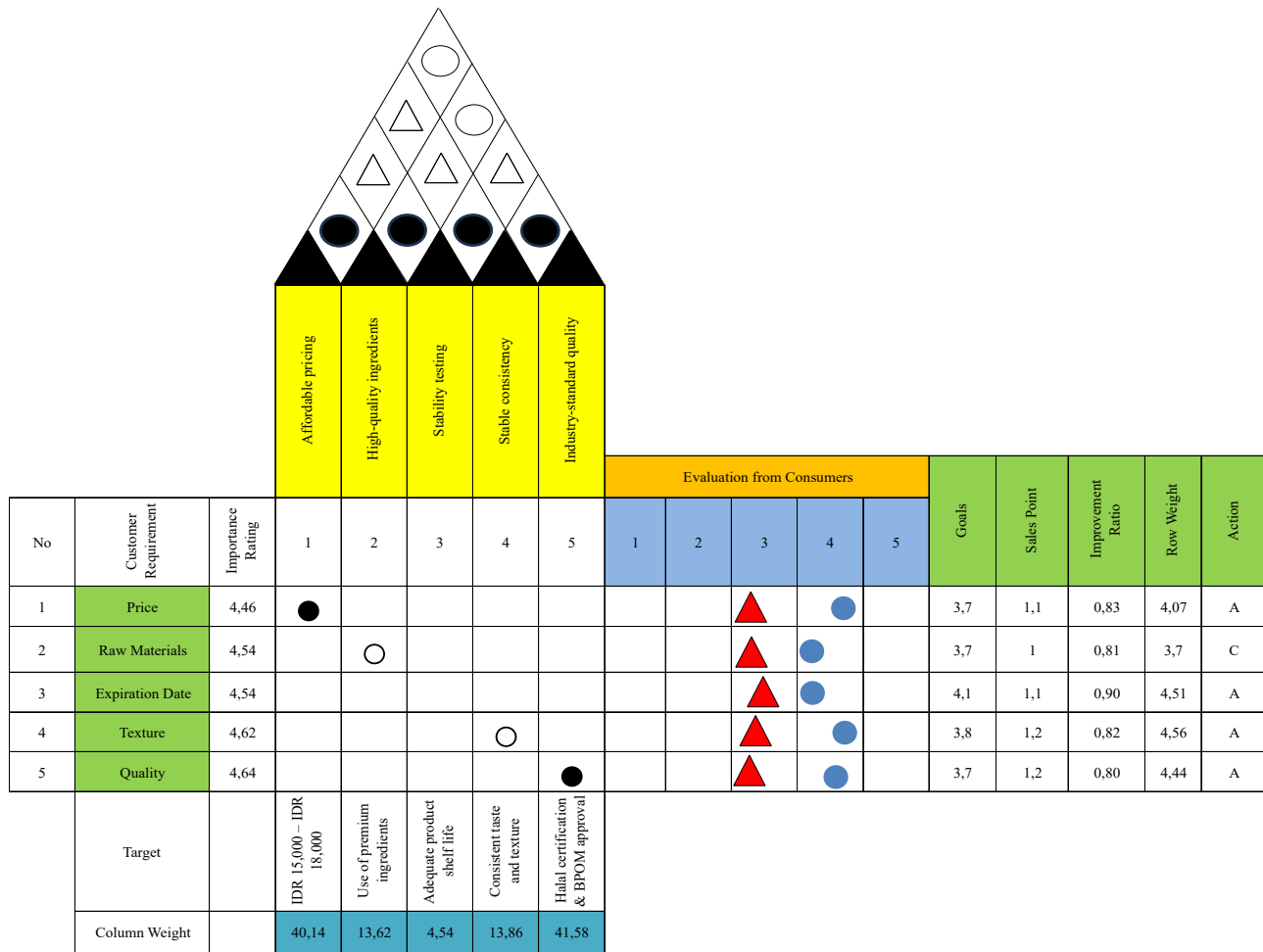


Figure 5: House of Quality (HOQ)

Based on Figure 5 (House of Quality), the complete HOQ matrix illustrates the integrated relationship between customer requirements, technical requirements, competitive evaluation, and strategic priorities in the development of the Fruit and Nougat (FRUGATO) product. The correlation roof indicates both supportive and conflicting relationships among technical requirements, suggesting that improvements in areas such as affordable pricing and the use of high-quality ingredients must be carefully balanced to avoid potential trade-offs. The relationship matrix confirms that price and quality exhibit strong correlations with their respective technical requirements, while raw materials and texture show moderate relationships, and expiration date shows a weak relationship with stability testing. Furthermore, the competitive evaluation demonstrates that the developed FRUGATO product outperforms competing products across all assessed attributes. The column weight analysis highlights industry-standard quality and affordable pricing as the highest technical priorities, followed by stable consistency, high-quality ingredients, and stability testing. Overall, the HOQ framework effectively

translates consumer expectations into actionable technical strategies to enhance the competitiveness and market readiness of the FRUGATO.

3.4 Results and Analysis of HOQ

This evaluation was conducted to determine strategic actions in the development of the healthy snack product Fruit and Nougat (FRUGATO). The analysis assists the company in defining appropriate measures to enhance product competitiveness in the market. The following sections present the results of the HOQ analysis related to product development strategies.

a. Competitor Analysis

Based on the analysis, five main consumer needs (Voice of Customer – VoC) were identified for the development of the FRUGATO product, namely price, raw materials, expiration date, texture, and quality. The competitive evaluation indicates that FRUGATO achieved higher consumer evaluations than the competing product across all assessed attributes. The highest Competitive Customer Evaluation (CCE) values were obtained for texture and quality (4.76), followed by raw materials (4.74), expiration date (4.68), and price (4.66). These findings indicate that

texture consistency and perceived product quality represent the main competitive advantages of FRUGATO.

The consumer requirements were translated into technical priorities through the House of Quality (HOQ) analysis. Based on the row weight and action-priority analysis, price, expiration date, texture, and quality were classified as Action A, requiring direct improvement to enhance competitiveness. Meanwhile, raw materials were categorized as Action C, indicating that existing standards should be maintained while ensuring cost efficiency and supply consistency.

Therefore, the development strategy should focus on pricing optimization, shelf-life improvement, texture consistency, and quality control. Although raw materials do not require immediate improvement, their quality and availability remain important for supporting FRUGATO performance.

b. Technical Aspect Analysis

Based on the relationship matrix between customer requirements and technical requirements, industry-standard quality and affordable pricing were identified as the highest technical priorities, followed by stable consistency and high-quality ingredients. These results indicate that maintaining product quality and pricing strategy require the greatest attention, while texture consistency and ingredient quality remain important supporting factors. Therefore, the company should balance affordability with strict quality control and consistent formulation.

Furthermore, texture obtained the highest row weight (4.56) among all customer requirements, indicating that formulation consistency should be considered a critical aspect in FRUGATO product development. Improvements in storage methods and the application of natural additives may support shelf-life extension while maintaining sensory characteristics and nutritional quality (Teshome et al., 2022). In addition, the incorporation of dietary fiber-based ingredients in snack formulations has been reported to influence physical characteristics, texture properties, and product quality (Capriles et al., 2021).

As a strategic approach, the company may implement technical actions aligned with the Action A priorities identified in the HOQ analysis, namely price, expiration date, texture, and quality. These actions include formulation optimization, stability testing, and raw material quality control under Action C to maintain efficiency and standards. Pricing strategies through market segmentation and promotional approaches can also improve product attractiveness. These initiatives are expected to

maintain FRUGATO's competitive advantage, particularly in texture and quality.

4. Conclusion

This study applied the Quality Function Deployment (QFD) method to identify consumer preferences and determine the technical priorities for developing the Fruit and Nougat (FRUGATO) healthy snack product. Based on the responses from 50 respondents, five main customer requirements were identified, including price, quality, texture, expiration period, and raw materials. Among these attributes, quality and texture were considered the most important factors based on the Importance Rating and Competitive Customer Evaluation results. The House of Quality (HOQ) analysis showed that industry-standard quality and affordable pricing were the main technical priorities, followed by stable consistency and high-quality ingredients. The competitive evaluation showed that FRUGATO achieved better performance than the competing product across all evaluated attributes, indicating its potential in the healthy snack market. However, this study was limited by the number of respondents and the specific demographic group involved. Further research may consider a larger and more diverse sample, additional sensory and nutritional evaluations, and the integration of QFD with other decision-making methods.

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