Product development of avocado-coffee using Quality Function Deployment method in Doesoen Sirap coffee shop, Semarang, Central Java

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Abstract. The millennial lifestyle encourages the development of coffee drinks, accompanied by the proliferation of coffee shops. Coffee and avocado are some of the potential plantation products in Dusun Sirap, Semarang. Currently, there is no processing of avocado plantation products at the coffee shop. This study aimed to produce avocado coffee at the Doesoen Sirap coffee shop according to consumer preference by Quality Function Deployment method. Data collection was carried out by distributing questionnaires and interviews. The questionnaires showed that seven attributes, namely taste, texture, color, size, price, topping, and drinking aids in avocado coffee on the market today, have not satisfied consumers. Therefore, technical needs are required to achieve customer satisfaction on these attributes. Avocado coffee has eight technical requirements. One of the highest technical requirements is the mass ratio of avocado, ice, water, and sugar to create the sweet taste of avocado juice. After forming the House of Quality matrix, there are three design concepts for the avocado coffee prototype that will be made. Based on interviews with the shop barista as a trained panelist, avocado coffee products with a sugar dose of 25 mg were the chosen concept.

1. Introduction
Based on the Agricultural Data and Information System Center of the Ministry of Agriculture information, the total national coffee consumption in 2016 reached 250 thousand tons, growing by 10.54% to 276 thousand tons. During the 2016-2021 period, Indonesia's coffee consumption is predicted to grow by an average of 8.22%/year. Based on the Ministry of Agriculture reports, in 2021, the coffee supply is predicted to reach 795 thousand tons with a total consumption of 370 thousand tons. Smallholder coffee entrepreneurs supply around 94.5% of coffee production in Indonesia. Around 81.87% is Robusta coffee production originating from South Sumatra, Lampung, Bengkulu, East Java and Central Java.

Research and Development reported in Kompas, PT Toffin and Mix Marketing & Communication argue that Indonesia's number of coffee shops will almost triple in the last three years. In 2016, the number was 1,083 shops, and in 2019, the number reached more than 2,937 shops [1]. However, in 2021 the number of coffee shop visitors decreased due to social restrictions during the Covid-19 pandemic. Currently, coffee shop owners are competing to attract customers by providing a comfortable and open concept of a shop room, making local coffee shops grow [2]. One of the local coffee shops that have been around since 2017 is Doesoen Sirap Coffee Shop which is located in Dusun Sirap, Kelurahan...
Village, Jambu District, Semarang Regency. Jambu District is one of the coffee plantation commodity areas in Central Java that the Farmers Group Association manages. Besides coffee, other plantation commodities are salak, durian, jackfruit, sugar palm, cloves, vanilla and avocado. However, one of the plantation products in Dusun Sirap, namely avocado, has not been used as an additional ingredient for coffee drinks, even though avocados can be used as an additional coffee drink called avocado coffee.

According to online survey data conducted by Statista in October 2019 and early 2020, to 310 respondents regarding the correct choice topping for drinking coffee, avocado topping is one of the toppings recommended by customers in Indonesia with 28.71% [3]. The addition of avocado topping to coffee drinks is in avocado juice, which has a more excellent ratio than the volume of coffee. According to Adventa [4], avocado coffee is a coffee menu favored by consumers at the KULO Coffee Shop, which is named avocatto or avocado milk coffee ice. Avocado coffee is made to lift the taste of avocado, and when mixed with the bitter taste of coffee, it will balance out. The availability of avocados in Dusun Sirap is an opportunity to develop avocado coffee products because if we used durian and jackfruit, consumer interest in these toppings is still lacking. Besides, that jackfruit and durian are seasonal fruits whose availability is still limited. According to [5] avocados have a fruiting season in December, January, and February but every month, avocados in Dusun Sirap always harvest because according to Kurniawan [5], in Indonesia—where natural conditions are suitable for planting avocados, the harvest season will occur every month.

The problem of processing avocado coffee at the Doesoen Sirap Coffee Shop is that the dosage or formulation of raw materials is unknown, so the organoleptic properties and appearance of the product are consistent from time to time and following consumer desires. Therefore, to determine the formulation of avocado coffee raw materials, a Quality Function Deployment (QFD) method is needed. The QFD method is a product development method that captures and translates consumer voices into the characteristics of the desired product prototype [5]. The result of the QFD method is the design of technical requirements to meet consumer attributes. The technical requirement plan is then translated into a product prototype, then tested by trained panelists to produce avocado coffee products ready to be launched. Therefore, the research objectives of developing avocado coffee products include determining the characteristics of avocado coffee according to consumer desires and designing the process of making avocado coffee according to consumer desires based on the QFD method.

2. Material and methods

2.1. Conceptual model

The research method used is QFD with the first step is identification of the consumer needs (Figure 1). The information required from the respondents was collected by means of a questionnaire. As many as 100 respondents were selected based on coffee shop customers or those who live in Semarang and its surroundings and have consumed avocado coffee on the market. The voice of the consumer is then processed into a technical character and translated by the producer into an alternative concept development. Second step, concept design is carried out using the House of Quality (HoQ) matrix on QFD phase 1. The stages of QFD phase 1 include [6]:
1. Matrix of customer needs, obtained from the results of interviews and observations.
2. Planning matrix, showing the level of satisfaction and importance of the attributes of consumer needs.
3. Technical characteristics.
4. Matrix relations.
5. Correlation of technical characteristics.
6. Technical matrix

The next step, through brainstorming, product trials, and organoleptic tests by baristas and shop managers will produce prototypes according to consumer desires.
2.2. Data analysis
This study uses the QFD method by translating consumer desires obtained from the results of the questionnaire recapitulation. The recapitulation results are then processed and calculated to determine the attribute value. The next stage is technical characteristics and making a House of Quality (HoQ). Development of a prototype concept based on HoQ matrix information and literature. Conclusions are drawn from the results of research that has been done.

3. Results and discussion

3.1. Identification of consumer needs
The selection of attribute specifications that will be designed in accordance with the wishes of consumers is by choosing the highest percentage value among the answer choices for each attribute on the questionnaire that has been distributed. The results of the recapitulation of avocado attributes that consumers want are in Table 1.

| No. | Attributes             | Targets                                      | Percentage (%) |
|-----|------------------------|----------------------------------------------|----------------|
| 1   | Coffee taste           | Little sweet                                 | 58             |
| 2   | Avocado flavor         | Sweet                                       | 53             |
| 3   | Overall taste          | Balance between coffee and avocado           | 72             |
| 4   | Avocado juice texture  | A little thick and soft                      | 56             |
| 5   | Color/Appearance       | Green color gradation below and brown above  | 79             |
| 6   | Size                   | 350 ml                                      | 84             |
| 7   | Price                  | 18,000 – 21,000 IDR                         | 54             |
| 8   | Topping                | Vanilla ice cream and chocolate ice cream   | 32             |
| 9   | Drinking aids          | Spoon straw                                 | 80             |

Table 1. The results of the recapitulation of avocado coffee attributes that consumers want.

The design of avocado coffee to produce these attribute specifications was carried out by researchers and in collaboration with the Doesoen Sirap Coffee Shop which already has professional certification because it has been in the field of compounding and making coffee-based drinks.
3.2. Creating the house of quality

According to Wagiono & Hamrah [7], QFD method is widely used in identifying consumer needs to be developed. The QFD method creates communication between the user (voice of customer) and maker (voice of engineer) of a product to avoid possible market misses. Consumer needs are obtained from distributing questionnaires regarding the attributes of avocado coffee that consumers want, the level of performance of avocado coffee products that are already on the market and the level of consumer demand for avocado coffee that will be developed. House of Quality (HoQ) is a tool that supports the QFD method by using a matrix that connects the interests of consumers. The HoQ matrix was first used to display Voice of Customer (VoC) or consumer needs for technical responses [8]. The results of the HoQ are shown in Figure 2.

![Figure 2. House of quality for avocado coffee development.](image)

Based on the planning matrix on the HoQ chart, the nine attributes of avocado coffee on the market have not satisfied consumers because it has a negative gap. The improvement ratio is a measure of how much the producer must do an effort to meet consumer needs [9]. A ratio value of more than 1.5 requires a thorough improvement [10]. The planning matrix table shows that the avocado texture attribute requires overall improvement because it has a ratio of more than 1.5 with a slightly thick and soft avocado texture specification following consumer desires in the questionnaire results.

Based on the discussion results, all attributes except drinking aids have a selling point value of 1.5. A weighted value of 1.5 means that attribute changes can significantly affect the level of satisfaction and the level of sales of avocado coffee products [11]. As for the attribute of drinking aids, a value of 1.2 means that changes in these attributes have a small effect on the level of satisfaction and level of
sales because these attributes do not have a major effect on product development and only as a support for consumer convenience in consuming avocado coffee. Based on the discussion results, all attributes except drinking aids have a selling point value of 1.5. The calculation results indicate that the highest raw weight value is a priority for attribute improvement that needs to be prioritized by the Doesoen Sirap Coffee Shop. The order of improvement based on the raw weight value is the texture attributes, avocado taste, overall taste, price, coffee taste, product color, product size, toppings, and drinking aids.

The largest percentage of the attributes of avocado coffee that consumers want is a slightly sweet coffee taste, therefore based on the results of the discussion, the coffee shop uses 11 g of blended coffee brewed 30 ml of water using the espresso technique. The Doesoen Coffee Shop is ready to create a slightly sweet coffee attribute without adding sugar, because the coffee already has a sweet taste. The sensation of sweetness or sweetness of coffee is a sweet sensation obtained from the reaction of some carbohydrate content. The appropriate time for roasting coffee beans affects the sweet taste produced by steeping coffee [12]. The sweet taste sensation in coffee is caused by the caramelization reaction, the sugar compound (sucrose) turns into caramel compounds and contributes to the sweet taste sensation.

The best-blended coffee currently used by Doesoen Sirap Coffee Shop is with a ratio of 30% robusta coffee beans and 70% arabica coffee beans. Blending or mixing is done to get the advantage of the two types of coffee being mixed [13]. The addition of robusta coffee to blended coffee serves to reduce the sour taste of arabica coffee. While the role of Arabica coffee can reduce the bitter taste and increase the aroma produced. Espresso brewing requires a specific tool commonly called an espresso machine. Apart from being served alone, espresso is often mixed with milk, milk cream (foam), and hot water [14]. Espresso base coffee is espresso-based coffee drinks such as cappuccino, latte, americano, espresso macchiato, and others. Therefore, the espresso brewing technique was chosen by the Doesoen Sirap coffee shop because it is suitable when combined with sweeteners such as milk, ice cream or avocado juice so that it will produce the appropriate avocado coffee. The advantage of the espresso brewing process is that it takes a short time and the brewing results are separated from the coffee grounds.

The desired taste of avocado juice is sweet. Taste of avocado juice can be described as sweet along with added sugar [15]. To produce a sweet taste of avocado juice, the producer conducted an experiment in making avocado juice with different amounts of sugar and chose the type of local avocado from Dusun Sirap. According to the shop, local avocado has the characteristics of a creamy, sweet taste, moist flesh, small shape, and low price. It takes 150 g of avocado, 100 ml of ice cubes, 50 ml of water and a ratio of sugar to get a sweet avocado taste. Texture of avocado juice that consumers want is a little thick and soft. The texture of the juice can be described as the consistency of the juice according to the amount of water added. During the experimental process of making the product, a dose of 150 g of avocado with 100 ml of ice and 50 ml of water can produce a slightly thick texture of avocado juice. The time it takes for the texture of avocado juice to become soft is 1 minute [16].

To get the taste of avocado coffee that is balanced between the taste of coffee and the taste of avocado, the ratio of avocado coffee is 30 ml of espresso coffee, 295 ml of avocado juice, 5 ml of sweetened condensed milk, and 25 ml of ice cream as a topping. The desired color is a gradation of green below and brown above with the stages of preparation in the glass, namely pouring avocado juice then ice cream and coffee. The size of the desired avocado coffee product is 350 ml, so it takes a glass with a diameter of 8 cm and a length of 14 cm.

The price of the desired product is 18,000 - 21,000 IDR. To determine the selling price of a product, the company must first know the cost of production [17]. Based on the Cost of Goods Sold (COGS) calculation, the cost of selling avocado coffee for one serving is 15,061 IDR. Suppose the Doesoen Sirap Coffee Shop sells avocado coffee products in accordance with the consumer's wishes, with the COGS of avocado coffee being 15,061 IDR. In that case, the Doesoen Sirap Coffee Shop will profit around 20% - 39% of the cost of goods sold. The gross profit received by the shop is quite appropriate because some companies provide low product prices so that profits are low, but low prices can increase sales because they offer the best price points. Some avocado coffee prices on the market include Kedai Kulo and Janji Jiwa for 28,000 IDR and at Kedai Lain Hati for 26,000 IDR [18]. The desired topping is vanilla ice cream or chocolate ice cream, giving consumers a choice of options. The desired topping is vanilla
ice cream or chocolate ice cream, by giving consumers a choice between two flavors. The attribute of drinking aids does not have a technical requirement because the spoon straws used can be fulfilled by buying at the store and without the need for difficult technicalities. Apart from that, tools drinking only as a support in helping to consume avocado coffee drink products.

Avocado coffee product development was carried out based on the results of HoQ and QFD data analysis. The strong relationship between the attributes of consumer needs and technical needs should be prioritized, and followed by the relationship between consumer needs and technical needs that are moderate and weak. The relationship between technical requirements that have a strong positive relationship is also prioritized. Based on the calculation of the value of technical priorities, the order of priority of technical needs in a row is technical design 2,1,3,8,7,6,4 and 5.

3.3. Product prototype
The product prototype is the stage of making product samples that are expected to meet the requirements [19]. The requirement is that the prototype must be seen by consumers as an embodiment of the main attributes of the product concept. Avocado coffee product concept that will be made according to the technical needs of the HoQ matrix. The concept of making the prototype is focused on the second technical design, namely the ratio of the local avocado dose of 150 g, 100 ml of ice cubes, 50 ml of water and the difference in the sugar dosage because it has the highest priority technical value. Based on the results of discussions with the coffee shop, the concept of making avocado coffee consists of 3 alternatives. The three alternatives are using 15 mg sugar (5%), 25 mg sugar (8%), 30 mg sugar (10%).

The results of the three concepts, the barista as a trained panelist chose an alternative concept with a dose of 25 mg of sugar to create a sweet avocado juice taste and create a balanced overall taste between coffee and avocado. In addition to being tested by the barista, the selected concept results were also tested organoleptically by 10 respondents consisting of the head of the hamlet, the head of the farmer association, and other members of the shop manager. This test is only carried out to confirm the selected concept, not to verify the formulation results because the 10 panelists have no guarantees as expert panelists. Therefore, further testing is needed regarding the organoleptic test of the selected avocado coffee formula. The organoleptic test was carried out using a preference test with a score of 1 (dislike very much) to 4 (very much like) Based on the recapitulation results of the organoleptic test that the average value of the attributes of coffee taste, avocado taste, overall taste, viscosity/texture, and appearance, respectively is 3; 3.1; 3.2; 3.2; and 3 which means that respondents like the five attributes of the concept created and chosen by the coffee shop. Based on the results of the selected concept design and in accordance with the technical design, the results of the avocado coffee making process are shown in Figure 3.

![Figure 3. Avocado coffee products side view and top view.](image)

4. Conclusion
The characteristics of avocado coffee that consumers want are a slightly sweet coffee taste, a sweet avocado taste, a balanced taste of coffee and avocado blend, a soft and slightly thick texture of avocado juice, an attractive appearance, an affordable price, which is around 18,000 - 21,000 IDR with a product
size of 350 ml, and there are options for adding toppings between chocolate ice cream and vanilla ice cream.

The design concept of making avocado coffee is selected according to the wishes of consumers, namely using blended coffee and brewed with espresso to create a slightly sweet coffee taste; mash 150 g local avocado, 100 ml ice cubes, 50 ml water and 25 mg sugar for 1 minute to create a sweet avocado juice taste and slightly thick and creamy avocado juice texture, and minimize raw material costs by choosing local coffee and avocado to get a low cost of goods sold so that it can produce as much as 350 ml of avocado coffee and has a price ranging from 18,000 - 21,000 IDR.

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