



## ANALYSIS OF CONSUMER BEHAVIOR IN CHOOSING ATTRIBUTES OF LARGE RED CHILI WITH A CONJOINT ANALYSIS APPROACH

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**Abstract.** Large red chili is a high value horticultural commodity that plays a vital role in meeting Indonesia's food demands, both for domestic consumption and industrial purposes. The high production rate of red chili corresponds with increasing consumer needs, influenced by diverse preferences that shape purchasing behavior, perceptions, and decisions. This study aims to identify the attributes most considered by consumers and analyze the combinations of large red chili attributes in Bandung City based on consumer preferences. A quantitative descriptive method was employed using questionnaires, with perceptual mapping applied to evaluate consumer perceptions and conjoint analysis used to determine consumer preferences. The findings reveal that consumers' perceptions of price and freshness attributes tend to be neutral, with average scores of 3 on a Likert scale. Meanwhile, shelf life, taste, and color are perceived positively, with an average score of 4. Regarding preferences, consumers prioritize a combination of affordable prices (<Rp20,000.00/kg), high shelf life (5–6 days), very fresh conditions, mildly spicy taste, and bright red color. Freshness is identified as the most critical factor among all attributes based on its relative importance in shaping consumer preferences.

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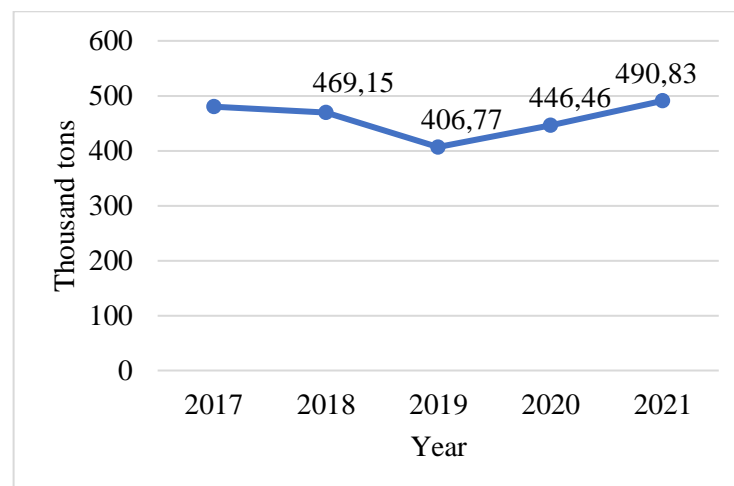
### INTRODUCTION

Red chili (*Capsicum annum L.*) is one of the agricultural commodities categorized as a horticultural crop that is highly favored by the Indonesian population as a cooking spice (Munir et al., 2018). Red chili consists of two types, which are large red chili and curly red chili. The differences between those types lie in their physical appearance and level of spiciness (Pasaribu, 2023). This crop holds a vital role as a vegetable that supports domestic demand, particularly in the food industry, making it one of the vegetables with considerable economic value. The agribusiness potential of red chili is highly favorable for further development, as it is an essential ingredient in daily cooking,

especially for housewives, and is frequently used and consumed as a basic spice and food enhancer (Lubis, 2021).

According to data from the Central Bureau of Statistics, red chili, along with shallot, cabbage, potato, and tomato, is among the top five most-produced vegetable commodities (BPS, 2024). Evidence of this can be seen in 2021, when red chili production in Indonesia reached 2.75 million tons, with West Java being the largest producing province in the country (BPS, 2024). The production volume corresponds to the growth in population and the national economy, which consistently drives the rising demand and consumption of red chili (Fahlevi, 2024). According to data from the 2021 National Socio-Economic Survey (Susenas) conducted in September, the average red chili consumption among the Indonesian population was 0.15 kilograms (kg) per capita per month.

Figure 1 shows the graph of average red chili consumption in the household sector at the national level, which indicates fluctuations over the past five years, although the differences are not particularly significant. Based on the infographic, households' consumption of red chili in 2021 reached 44.37 thousand tons, showing an increase from the previous year. Notably, household consumers accounted for 72.94 percent of the total red chili consumption (BPS, 2022). These fluctuations did not affect consumer purchasing behavior, as red chili remains an essential ingredient that supports their daily consumption needs (Padapi, 2022).



Source: Data Processed, 2024

**Figure 1. Graph of national average red chili consumption in the household sector 2017-2021**

The consumption of red chili is adjusted according to the needs of a society. The increasingly diverse needs and preferences of consumers naturally lead to a wider range of choices available to them. (Fauza et al., 2018). The choice is determined by consumers' behavior, which influences their perceptions and preferences in making purchasing decisions. Perception refers to the view or process emerging within an individual when organizing and interpreting sensory impressions to give meaning related to their environment or desired objects — in this case, a product. Preference, on the other hand, refers to the tendency or condition that influences a consumer's decision regarding their interest or desire to purchase and own something. Preference is also defined as the act of choosing or selecting (Fauza et al., 2018). Both perception and preference are components of consumer behavior that serve as key factors influencing a consumer's decision to purchase or acquire a particular good or product.

Given the importance of considering attributes selected based on consumer behavior in meeting their needs, this study aims to examine the level of consumer perception and preference in choosing attributes of large red chili, focusing on specific attributes such as price, shelf life, freshness, taste, and

color. By identifying the combination of large red chili attributes preferred by consumers, this research can assist traders, producers (farmers), and researchers in developing commodity varieties aligned with consumer behavior. The objective of this study is to identify the attributes considered in consumer perception and to determine the preferred combination of large red chili attributes in Bandung City based on consumer preference levels.

## METHOD

Caringin Central Market, located in Babakan Ciparay, Babakan Ciparay District, Bandung City, West Java, was selected as the research site based on the consideration that it is one of the largest traditional markets in Bandung, serving consumers and both large and small scale traders. Additionally, Caringin Central Market functions as a major supplier of various types of red chili from several regions and is recognized as one of the markets capable of influencing price formation with a 99% confidence level (Sukmawati, D., 2024). This study employs a quantitative descriptive approach using a survey method, where quantitative descriptive research provides an overview of the phenomena and objects under investigation. It is aimed at collecting comprehensive information regarding the condition of a phenomenon or a specific variable.

The data collection methods used in this study include primary data obtained through questionnaires and secondary data gathered through literature review. The data collection technique employed non-probability sampling, specifically using incidental or accidental sampling, meaning that samples were selected unintentionally or by chance, based on individuals who happened to meet the required characteristics (Sugiyono, 2019). The Bernoulli formula was used to determine the sample size, resulting in more than 96 respondents, which was then rounded to 100 respondents. The data analysis methods applied in this study include perceptual mapping analysis, which illustrates consumer perceptions or views of the attributes under consideration, and conjoint analysis, which is used to describe consumer preferences or the tendency toward prioritized combinations of attributes when purchasing large red chili. Conjoint analysis is a multivariate analysis method used to understand respondents' reactions in determining their level of preference toward an object, such as product attributes (Natania et al., 2024). Thus, the conjoint model is used to describe the level of importance of attribute combinations as well as the total utility perceived by consumers, which is illustrated based on their partial utility or values.

## RESULT AND DISCUSSION

### Consumer Perception of Large Red Chili Attributes

Perception is an act or process through which an individual selects, organizes, and assigns meaning and interpretation to stimuli from their environment. This perception often emerges as a form of motivation that influences consumer behavior, particularly in making decisions to purchase a product (Subakti et al., 2018). Perception is influenced by several factors, both internal and external (Arman et al., 2024). Internal influences on perception are factors originating from within the individual, such as motives, readiness and expectations, stimulus intensity, and social interactions. In contrast, external influences include strong stimuli, physiological and psychological aspects, as well as environmental conditions (Subakti et al., 2018).

Consumer perception of large red chili attributes can be illustrated through perceptual mapping analysis, a method used to support decision-making regarding product positioning or attributes, which can be recognized and applied across a broad market scope (Gigauri, 2019). Perception is widely used to understand the relationship between two or more attributes that are viewed and prioritized by consumers. This perception can be visually represented using perceptual mapping analysis, which illustrates how customers identify key targets that are most important and consistently considered as competitive factors. These factors are derived from collected data and reflect consumer perceptions of

the attributes that represent brands in the market (Aramayis, 2014). Thus, perceptual mapping serves as a visual and effective guide for producers and traders of large red chili, because its two-dimensional form allows for a clear illustration of patterns in the attributes that consumers pay attention to.

Perceptual mapping is derived from the average or mean score in the analyzed data, calculated by summing the total values of all attribute variables obtained and then dividing by the number of attributes. Mathematically, this can be expressed by the equation (1).

$$x = \frac{\sum X_i}{n} = \frac{1}{n}(X_1 + X_2 + \dots + X_n) \quad (1)$$

Where :

$X$  = Mean

$\Sigma$  = Sum

$X_n$  =  $n$ -th variable

$n$  = Total number of data or sample

Based on the Likert scale scoring results, the average values of the attributes representing consumer perception at Caringin Central Market are as follows:

**Table 1. Average consumer perception of large red chili attributes**

Indicator	Mean
Price	3.3
Shelf Life	3.6
Level of Freshness	3.2
Taste	3.7
Colour	3.9

Source: Data Processed, 2024

Table 1 shows that the average consumer perception of the attributes of large red chili, specifically price sensibility and level of freshness, can be rounded to 3, indicating a neutral stance. This suggests that although consumers consider these attributes, they do not significantly influence purchasing decisions, as large red chili is a staple in daily life and will be purchased regardless of high prices or suboptimal freshness. In contrast, attributes such as shelf life, taste, and color can be rounded to 4, meaning consumers agree that these factors are important and consistently considered when purchasing large red chili. However, the differences among the average values of attributes are not highly significant, indicating that consumers generally take all five attributes into account when making their purchasing decisions.

Based on the average data obtained, a perceptual mapping can be constructed to visualize the differences and illustrate the attribute scores of the product, making them easier to identify and interpret. The following perceptual mapping illustrates consumer perceptions in selecting large red chili based on the importance of its attributes at Caringin Central Market, Bandung.



Source: Data Processed, 2024

**Figure 2. Perceptual mapping of the importance of large red chili attributes**

### **Consumer Preference for Attribute Combinations of Large Red Chili**

As a factor influencing an individual's liking or disliking of a product, preference reflects the condition in which consumers make decisions based on their interest or desire to purchase and possess a product. These choices arise during the evaluation stage, where consumers consider various alternatives before making a decision (Haeriah et al., 2024). According to Nicholson dalam Arumdewi (2024), The relationship concerning consumer preferences can be understood through three fundamental human characteristics which are completeness, transitivity, and continuity. In addition, Kotler and Keller support the idea that the evaluation stage of consumer preference emerges as part of the hierarchy of effects model, which includes the following steps: awareness, knowledge, liking, preference, and intention to buy. These stages serve as key considerations that influence consumer decision-making in the process of purchasing or owning a product.

Consumer preference is formed on the basis of habitual choices among products and develops through repeated behavior, eventually becoming a long term memory (Kusumawati et al., 2024). Consumer preference can also be triggered by the attributes inherent in a product, which serve as key considerations influencing an individual to purchase and select a particular item. These attributes encompass all characteristics attached to the product that consumers evaluate, making the product more appealing and likely to be chosen over other products (Pamartha, 2016). All elements contained within the product are necessarily considered important by consumers and thus serve as the basis for making purchasing decisions..

The method used to determine consumer preferences for large red chili attributes is conjoint analysis. Conjoint analysis is a research tool commonly used in marketing to identify consumer preferences and is applied to address issues related to product demand and to design new product strategies (Agarwal et al., 2015). Conjoint analysis provides a means of distinguishing between combinations of attributes based on the levels most preferred by consumers. This method involves presenting respondents with a series of product attribute profiles that have been carefully designed and defined by specific levels or indicators of each attribute. These combinations are then used as options for respondents to evaluate and express their level of agreement or preference. This conjoint analysis was conducted using the Statistical Program for the Social Sciences (SPSS) version 22. The analysis follows a series of systematic steps designed to produce accurate and meaningful results.

The first step in this conjoint analysis is problem formulation. This involves identifying and defining the relevant attributes and their corresponding levels, which are essential for constructing the stimuli to be evaluated by respondents. The levels or degrees of each attribute are represented by values

assumed by the attribute, and once the attributes have been identified, the appropriate levels must be selected. The chosen attributes also determine the number of parameters that need to be estimated and influence the total number of stimuli that will be evaluated by respondents. Limiting the number of attribute levels is necessary to ensure the formation of relevant parameters and to achieve the desired level of accuracy in the research (Armanto, 2023). The determination of attributes and their levels is based on a preliminary survey conducted prior to the main research, previous studies, and supporting theories. As a result, the attributes and their corresponding levels, which serve as parameters in this study, are presented in Table 2.

**Table 2. Attributes and attribute levels of large red chili**

No	Attribute	Attribute Levels
1	Price	Cheap (<IDR 20,000/kg) Moderate (IDR 20,000 – IDR 30,000/kg) Expensive (>IDR 30,000/kg)
2	Shelf Live	Low (1 - 2 hari) Moderate (3 - 4 hari) High (5 - 6 hari)
3	Level of Freshness	Not Fresh Uneven Freshness Very Fresh
4	Taste	Less Spicy Spicy
5	Colour	Bright Red Dark Red

Source: Data Processed, 2024

This study employs five (5) attributes, with each attribute consisting of two (2) to three (3) levels. These attribute levels are then used to construct stimuli, forming combinations of attributes that generate utility and importance values based on their respective levels. The construction of these stimuli uses the full-profile approach, meaning that all possible combinations between attributes and their levels are included. Based on the attributes and levels used in this study, a total of 108 combinations ( $3 \times 3 \times 3 \times 2 \times 2$ ) of large red chili attributes can be generated.

The full-profile approach involves multiple-factor evaluation, utilizing a fractional factorial design known as orthogonal arrays, which allows for the estimation of all main effects. This approach was implemented using SPSS version 22, resulting in a total of 16 stimuli, as shown in the table 3.

**Table 3. Stimuli or profile cards of large red chili attribute combinations**

Profile Card	Stimuli (Combination of Attribute and Attribute Level)					Stimuli Status
	Price	Shelf Life	Level of Freshness	Taste	Colour	
1	Expensive	High	Uneven	Less spicy	Light Red	Design
2	Expensive	Moderate	Not Fresh	Spicy	Dark Red	Design
3	Moderate	Low	Not Fresh	Spicy	Bright Red	Design
4	Cheap	Low	Not Fresh	Spicy	Bright Red	Design
5	Cheap	Moderate	Uneven	Spicy	Bright Red	Design
6	Cheap	Low	Uneven	Spicy	Dark Red	Design
7	Cheap	High	Not Fresh	Less Spicy	Dark Red	Design
8	Cheap	Moderate	Very Fresh	Less Spicy	Bright Red	Design
9	Expensive	Low	Very Fresh	Pedas	Dark Red	Design
10	Expensive	Low	Not Fresh	Less Spicy	Bright Red	Design
11	Cheap	High	Not Fresh	Spicy	Dark Red	Design
12	Moderate	Moderate	Not Fresh	Less Spicy	Dark Red	Design
13	Moderate	High	Very Fresh	Spicy	Bright Red	Design
14	Cheap	Low	Not Fresh	Less Spicy	Bright Red	Design
15	Cheap	Low	Very Fresh	Less Spicy	Dark Red	Design
16	Moderate	Low	Uneven	Less Spicy	Dark Red	Design

Source: Data Processed, 2024

The conjoint analysis model which is used in the regression analysis procedure is expressed in equation (2)

$$Y_{ij} = \beta_0 + \sum_{i=1}^m \sum_{j=1}^{k_i} \beta_{ij} x_{ij} + \varepsilon_{ij} \quad (2)$$

Where:

$Y_{ij}$  = Ranking of all respondents

$\beta_0$  = Intercept

$k$  = Number of levels in the  $i$ -th attribute

$m$  = Total number of attributes

$X_{ij}$  = Dummy variable representing the  $j$ -th level of the  $i$ -th attribute

$\beta_{ij}$  = Part worth utility value of the  $j$ -th level of the  $i$ -th attribute

$\varepsilon$  = Error

Based on the analysis model, a column vector of size  $N \times 1$  is constructed for the dependent variable, where  $N$  represents the number of stimuli or profile cards, in this case 16 stimuli, resulting in a  $16 \times 1$  matrix  $Y$ . While the independent variables are represented by a matrix of size  $N \times k$  which records observations  $k$  variables  $X_1$  to  $X_k$  in the form of dummy variables depicted from the stimuli.  $N$  refers to the number of stimuli, and  $k$  refers to the number of dummy variables corresponding to the attribute levels of each attribute  $k - i$  and level  $k - j$ . Accordingly, the dummy variable coding for each attribute level in the consumer preference analysis of large red chili is represented with the  $X$  matrix having a size of  $16 \times 5$ . The equation model based on the 16 constructed stimuli is in equation (3).

$$Y_{ij} = \beta_0 + \beta_{11}x_{11} + \beta_{21}x_{21} + \beta_{31}x_{31} + \beta_{41}x_{41} + \beta_{51}x_{51} + \varepsilon_{ij} \quad (3)$$

Where  $Y_{ij}$  represents the total utility, and  $\beta_{ij}$  denotes the utility value of each attribute level, indicating the contribution of each level to the average score or agreement level given by respondents

toward the presented stimuli. The assumption is that the greater the value of  $\beta_{ij}$ , the higher the contribution of that particular attribute level to the consumer's overall assessment.

The values obtained from the output of the conjoint analysis, based on respondents' evaluations by assigning scores to the level of agreement with each attribute combination, are as follows:

**Table 4. Output results of consumer preference analysis for large red chili**

Attribute	Level	Utility Estimate	Standard Error
Price	<b>Cheap</b>	<b>0.168</b>	0.039
	Moderate	0.017	0.046
	Expensive	-0.184	0.046
	Low (1-2 hari)	-0.032	0.039
Shelf Life	Moderate (3-4 hari)	-0.007	0.046
	<b>High (5-6 hari)</b>	<b>0.039</b>	0.046
Level of Freshness	Not Fresh	-0.525	0.039
	Uneven Freshness	0.019	0.046
	<b>Very fresh</b>	<b>0.506</b>	0.046
Taste	<b>Less Spicy</b>	<b>0.010</b>	0.030
	Spicy	-0.010	0.030
Warna	<b>Bright Red</b>	<b>0.039</b>	0.030
	Dark Red	-0.039	0.030
(Constant)		3.099	0.034

Source: Data Processed, 2024

Table 4 presents the results of the conjoint analysis regarding consumer preferences for large red chili at Caringin Central Market in Bandung. The estimated part-worth utility values indicate that the most preferred price attribute among consumers is the cheap or lowest price, with a part-worth value of 0.168. For the shelf life attribute, consumers prefer large red chili with a high durability, specifically those that can last for 5 to 6 days, with a part-worth value of 0.039. In terms of freshness, the analysis shows that consumers favor large red chili that is in very fresh condition, reflected in the highest part-worth value of 0.506. For the taste attribute, consumers show a preference for large red chili that is mildly spicy, with a part-worth value of 0.010. Regarding colour, consumers prefer bright red chili, as indicated by a part-worth value of 0.039.

Based on Table 4 and the conjoint analysis model using dummy variable procedures applied to the 16 stimuli or profile cards, it is possible to calculate and rank the attribute combinations according to their total utility values. These total utilities are obtained by summing the individual part-worth utilities. The analysis, conducted using SPSS version 22, produced a correlation coefficient ( $r$ ) value of 0.986. Consequently, the coefficient of determination ( $r^2$ ) is 0.972. A coefficient of determination of 0.972 indicates a high level of goodness of fit, suggesting that the model fits the data well and provides an accurate representation of preferences of sampled consumer.



**Table 5. Total utility values based on all profile cards (stimuli) of red chili**

No	Profile Card	Total Utility Value	$r^2$	Rank
1	P1	3.022	0.972	8
2	P2	2.334	0.972	16
3	P3	2.588	0.972	13
4	P4	2.739	0.972	10
5	P5	3.308	0.972	5
6	P6	3.205	0.972	6
7	P7	2.752	0.972	9
<b>8</b>	<b>P8</b>	<b>3.815</b>	<b>0.972</b>	<b>1</b>
9	P9	3.340	0.972	4
10	P10	2.407	0.972	15
11	P11	2.732	0.972	12
12	P12	2.555	0.972	14
13	P13	3.690	0.972	3
14	P14	2.739	0.972	10
15	P15	3.712	0.972	2
16	P16	3.074	0.972	7

Source: Data Processed, 2024

Based on the table of total utility values combined with the coefficient of determination  $r^2$  presented in Table 5, it can be observed that consumers gave the highest score or level of agreement to profile card (stimulus) number 8, which recorded a total utility value of 3.815 or a final score of 4.787. This indicates that stimulus number 8 represents the most preferred combination of attributes according to consumers at Pasar Induk Caringin when purchasing large red chili. The combination of attributes in this most favored profile includes a low price (<IDR20,000.00/kg), medium shelf life (3–4 days), very fresh condition, mildly spicy taste, and a bright red colour.

The interpretation of relative importance values refers to the assessment of how significant each of the five attributes is in influencing consumer preferences. This analysis is used to highlight the overall importance of each attribute based on the choices and evaluations made by the respondents. An attribute with a higher relative importance value indicates that it receives greater attention and is more desirable to the respondents. The following table presents the results of the conjoint analysis, showing the relative importance values assigned to each attribute influencing consumer preferences for large red chili

**Table 6. The Interpretation of relative importance values of large red chili**

Attribute	Relative Importance Value
Price	21.63%
Shelf Life	17.43%
Level of Freshness	35.18%
Taste	11.54%
Colour	14.22%

Source: Data Processed, 2024

Table 6 presents the relative importance values of the attributes of large red chili according to respondents at the Caringin Main Market. Overall, respondents prioritize the freshness level of the chili, with a relative importance value of 35.18%. This is because consumers tend to carefully assess the freshness of the chili because it directly affects its quality and shelf life. Therefore, consumers primarily evaluate large red chili in terms of freshness, preferring those that are classified as very fresh. The second most important attribute for consumers in Caringin Main Market is price, with a relative

importance value of 21.63%. This is due to the fluctuating nature of chili prices, which are often affected by external factors such as national holidays and seasonal changes. Shelf life is the third attribute considered by consumers, with a relative importance value of 17.43%. This is because the respondents are end consumers who purchase chilies for household consumption. The frequency of purchase is not very high, making shelf life an important attribute to consider. Shelf life is directly proportional to the freshness level—the fresher the large red chili, the longer it is likely to last. Color is the fourth attribute that draws consumer attention, with a relative importance value of 14.22%. This is because chili color influences both its perceived freshness and flavor. The least important attribute according to respondents is taste, with a relative importance of 11.54%. This is due to the relatively uniform spiciness level of large red chilies, which makes the taste less distinguishable across different samples. Respondents generally perceive the flavor of large red chilies to be similar; thus, it is not a major deciding factor in their purchasing decisions.

## CONCLUSIONS

Consumer behavior in considering the purchase of large red chilies at the Caringin Main Market in Bandung can be analyzed based on individual perceptions and preferences toward the product. Consumer perception reflects how consumers view or interpret the product's attributes, while preference indicates the degree to which consumers are inclined to choose a particular product. In the context of purchasing large red chilies, price, freshness level, shelf life, taste, and color are the product attributes that receive the most attention.

The analysis reveals that consumer perceptions of the price and freshness attributes tend to be neutral, with average likert scale scores close to 3. This indicates that although these two attributes are considered, they do not significantly influence purchasing decisions. The underlying reason is that large red chili peppers are viewed as essential goods, which consumers continue to purchase despite high prices or suboptimal freshness. In contrast, the attributes of shelf life, taste, and color received average scores approaching 4, suggesting that consumers agree these aspects are important and serve as key factors in their purchasing considerations. Thus, while some attributes may have a limited impact on buying decisions, others related to product quality remain a priority for consumers at the Caringin Central Market.

As observed from part-worth utility values, consumer preferences at the Caringin Central Market in Bandung for purchasing and selecting large red chili peppers indicate that the most desired attribute is low price, with a part-worth value of 0.168. For the shelf-life attribute, consumers prefer chili peppers that can last 5 to 6 days, corresponding to a part-worth value of 0.039. In terms of freshness, the analysis shows that consumers strongly favor chili peppers that are very fresh, reflected in the highest part-worth value of 0.506. Regarding taste, consumers tend to prefer chili peppers with a milder spiciness, with a part-worth value of 0.010. Consumers favor bright red chili peppers for the color attribute, which is supported by a part-worth value of 0.039. Based on the total utility value and the coefficient of determination  $r^2$ , it is evident that consumers overwhelmingly agreed with the attribute combination presented in stimuli number 8, which achieved the highest total utility value of 3.815, or a final score of 4.787. This combination consists of low price (<Rp20,000.00/kg), moderate shelf life (3–4 days), very fresh condition, mildly spicy taste, and bright red color. While among all the attributes of large red chili peppers, the relative importance analysis shows that freshness (35.18%) is the most prioritized attribute by consumers at the Caringin Central Market in Bandung.

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