

## CONSUMER PREFERENCE AND WILLINGNESS TO PAY FOR LOCAL ORANGE OF RIMAU GERGA LEBONG

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**Abstract:** The increasing demand and consumption of oranges have led many local governments to participate in developing superior local orange varieties that are acceptable to consumers, such as the local orange variety called "rimau gerga lebong" from Bengkulu Province. This study aims to analyze consumers' preferences and willingness to pay for rimau gerga lebong oranges. Primary data for the study were collected through an online survey of 200 respondents who have purchased and consumed oranges in Bengkulu, Sumatera Selatan, and Jambi regions. The survey was conducted from April to May 2022. The data were analyzed using a discrete choice experiment (DCE) and willingness to pay (WTP) analysis. Four attributes were considered in the DCE and WTP analyses: taste, water content, freshness, and price. The results indicate that consumers prefer gerga oranges due to their fresh, high water content, and sweet taste attributes. Furthermore, consumers are willing to pay a higher price, with a maximum additional price of Rp. 936.08/kg for fresh oranges, Rp. 497.59/kg for juicy oranges, and Rp. 307.89/kg for sweet oranges. Improving the quality of orange attributes according to consumer needs can lead to increased profits. The findings of this study provide valuable insights for breeders and marketers to ensure that orange quality aligns with the needs and desires of consumers. Based on these findings, several managerial implications can be formulated to enhance and maintain orange attributes.

**Keywords:** discrete choice experiment, orange attributes, preference, utility product, willingness to pay

**Abstrak:** Permintaan dan konsumsi jeruk yang terus meningkat menyebabkan banyak pemerintah daerah yang ikut mengembangkan varietas jeruk lokal unggulan yang dapat diterima oleh konsumen, salah satunya jeruk lokal rimau gerga lebong, yang merupakan jeruk varietas unggulan dari Provinsi Bengkulu. Penelitian ini bertujuan untuk menganalisis preferensi dan kesediaan membayar konsumen terhadap jeruk lokal rimau gerga lebong. Penelitian ini menggunakan data primer dari survei daring terhadap 200 responden yang pernah membeli dan mengonsumsi jeruk lokal rimau gerga lebong di Provinsi Bengkulu, Sumatera Selatan, dan Jambi, pengambilan data dilakukan pada bulan April dan Mei 2022. Data dianalisis menggunakan metode analisis discrete choice experiment (DCE) dan willingness to pay (WTP). Pada analisis DCE dan WTP, penelitian ini menggunakan empat atribut, yaitu rasa, kandungan air, kesegaran, dan harga. Hasil penelitian menunjukkan bahwa konsumen menyukai atribut jeruk yang segar, kandungan air tinggi, dan cita rasa yang manis. Konsumen juga bersedia untuk membayar lebih tinggi dengan tambahan harga maksimal yang dapat dikeluarkan sebesar Rp. 936.08/kg untuk jeruk yang segar, Rp. 497.59/kg untuk jeruk yang juicy, dan Rp 307.89/kg untuk jeruk yang manis. Peningkatan kualitas atribut jeruk yang sesuai dengan kebutuhan konsumen akan meningkatkan permintaan konsumen untuk membeli jeruk rimau gerga. Hasil dari penelitian ini dapat memberikan informasi kepada pembudidaya dan pemasar untuk menjamin kualitas jeruk untuk memenuhi kebutuhan dan keinginan konsumen. Beberapa implikasi manajerial untuk meningkatkan dan menjaga atribut jeruk dapat dirumuskan dari temuan terkait.

**Kata kunci:** atribut jeruk, discrete choice experiment, preferensi, produk utility, willingness to pay

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## INTRODUCTION

Oranges are fruits that are widely consumed by Indonesians, and there has been a trend of increasing demand for oranges every year (Balitbangtan, 2005). In March 2022, the orange consumption rate among the Indonesian population reached 36.94%, surpassing bananas (32.59%) and papayas (25.20%) (BPS, 2022). The average orange consumption in Indonesia is 0.093 kg per capita per week, which is higher than the consumption of other fruits such as papaya (0.083 kg per week) and Ambon banana (0.052 kg per capita per week) (BPS, 2022). Oranges are cultivated by farmers in lowland to highland areas, with different varieties available (Balitbangtan, 2005). Recognizing the development potential, the provincial government of Bengkulu has focused on developing one of the orange varieties known as the rimau gerga lebong orange (hereinafter referred to as gerga orange) (Surahman et al. 2016). In 2012, gerga orange was designated as one of the leading national commodities with Decree No. 2087/Kpts/SA.120/6/2012 (Surahman et al. 2016; Siagian et al. 2021). Gerga oranges were developed by the Agricultural Technology Assessment Center (BPTP) in collaboration with seven farmer groups in Bengkulu Province.

However, the entry of imported fruits supported by the ASEAN Economic Community program in 2015 has opened up opportunities for imported fruits to enter the Indonesian market. The increasingly liberalized market has affected horticultural crops, including oranges (Kemendag, 2015). To survive in this highly competitive market, fruit marketers have shifted their focus to being consumer and marketing-oriented. They no longer solely focus on production and sales but prioritize selling products that meet consumer needs and desires. Marketers strive to fulfill consumer needs and desires (Canavari et al. 2005; Canavari et al. 2010; Nurmalina et al. 2014; Ceschi et al. 2018; Rachmi et al. 2018).

Consumer desires can be assessed based on their evaluations of product quality, which can be measured through intrinsic and extrinsic attributes. Intrinsic attributes are inherent qualities of the fruit that cannot be changed, such as taste, freshness, and water content. These attributes play a significant role in assessing the quality of the product. On the other hand, extrinsic attributes are external factors that contribute to increasing the added value of the core product and can

be altered without changing the natural properties of the product. Price is an example of an extrinsic attribute (Grunert, 2002). Evaluating these attributes can help marketers and researchers enhance the added value of attribute quality.

Gerga oranges are characterized by their sweet taste with a hint of sourness, medium to large size, and orange fruit skin color (Balitbangtan, 2014). Limited consumer knowledge about the RGL orange varieties can result in decreased demand, similar to the issue faced by pomelo oranges (Nahraeni et al. 2019; Misman et al. 2021), where the diverse characteristics of the fruit do not align with consumer preferences, leading many farmers to stop growing them.

While previous studies have explored consumer preferences for orange fruits (Nahraeni et al. 2019; Priyambodo et al. 2019), research on consumer preferences for gerga oranges remains limited. Findings from Gallardo et al. (2014), who examined quality attributes of apples, peaches, cherries, and strawberries, revealed that taste attributes were the most crucial factor influencing consumer preferences and repeat purchases. Taste attributes also serve as distinguishing factors between products (Kim and House, 2012). Additionally, the attribute of freshness is considered essential and a primary consideration for purchasing orange fruits (Probowati et al. 2016). Local orange juices have shown good competitiveness (Sadeli and Utami, 2013; Nafisah et al. 2014; Bi et al. 2015) and possess advantages and high utility values (Nahraeni et al. 2019). The price attribute, although typically assigned the lowest utility value, is still valued by consumers as an indicator of product quality (Botelho et al. 2013; Gallardo et al. 2014; Tisselli et al. 2017; Aida et al. 2018; Ceschi et al. 2018; Kyutoku et al. 2018; Sepúlveda et al. 2022).

Consumer preference analysis can be conducted through an experimental approach using the DCE method, where respondents are presented with multiple choices and asked to select the type of oranges they would purchase based on various descriptions simulating market conditions (Jürkenbeck and Meyerding, 2019). By determining the choices that combine different fruit attributes, researchers can explore consumer preferences based on the external appearance of the fruit (Becker et al. 2016; Ceschi et al. 2018; Jürkenbeck and Meyerding, 2019; Koksai, 2019). This analysis enables the assessment of the usefulness and relative

importance of each attribute in a product (Nurdin and Damayanti, 2017).

Each individual or household aims to maximize their utility within a given income and determines the quantity of goods or services to consume. When product attributes have a positive value, consumers are willing to pay the maximum price, and these variables are considered to influence consumers' willingness to pay (Meenakshi et al. 2012; Fathia et al. 2018; Harianto et al. 2019; Sugiyanthi et al. 2020; Relawati et al. 2022). In the research conducted by Jürkenbeck and Meyerding (2019), consumers prioritize the quality of fruit attributes over price, including factors such as freshness, color, size, water content, and fruit origin.

Consumers are willing to pay higher prices when they perceive the product to be of better quality. A study by McCluskey et al. (2013) compared consumers' willingness to pay for two different apple varieties and found that consumers were willing to pay more for the variety that was perceived to have better fruit ripeness quality. Understanding consumer willingness to pay helps farmers determine the value of product quality attributes. Attributes that hold the highest value within the value chain assist farmers in focusing on adjusting product characteristics to meet the needs and desires of consumers (Gallardo et al. 2014).

Identifying consumer preferences for quality attributes and the amount of money consumers are willing to spend is crucial for farmers and marketers to develop effective strategies in targeting products to the right market segment (Ceschi et al. 2018). Based on this premise, this study aims to analyze consumer preferences for the attributes of gerga oranges and estimate the maximum amount of money consumers are willing to spend on these attributes.

## METHODS

This research was conducted in the provinces of Bengkulu, South Sumatra, and Jambi. The selection of these locations was purposive, considering that they could represent consumers of Gerga oranges, as these oranges have been widely marketed in these provinces. Moreover, people in these areas have different consumer characteristics, including demographic and economic differences. The data collection was carried out in April and May 2022.

The primary data used in this study were collected through an online survey of consumers of Gerga oranges. The questionnaire included questions related to the respondents' characteristics, as well as choice sets of combinations of orange attributes to assess consumer preferences and willingness to pay.

Sampling in this study was conducted using a non-probability sampling method, where consumers of Gerga oranges had different opportunities to be selected as respondents. The sample was taken from individuals in the population who were present at the research locations and were willing to participate as research subjects. A total of 200 respondents were included in this study. The data collection process involved the use of an online questionnaire instrument. The respondents included in the sample were consumers who had consumed Gerga oranges and were aged 17 years or older, representing various levels of education. Respondents in this age category were considered capable of assessing fruit product attributes and making responsible choices.

The analytical method used in this study involves the use of Discrete Choice Experiment (DCE) and Willingness to Pay (WTP) analysis tools. The DCE analysis is used to analyze preferences by designing alternative combinations of orange fruit attributes. Prior to constructing the choice sets, the researchers conducted open-ended interviews with five respondents from different groups, including traders, consumers, farmers, organoleptic researchers of Gerga oranges, and plantation extension workers. These interviews aimed to identify the attributes that influence consumers in choosing Gerga oranges. The interviews were conducted on August 25, 2021. Based on the results of the interviews and a literature review, the study selected four attributes with two attribute levels. Each attribute level was coded as a binary-valued variable. The attributes included freshness (new or less fresh), juiciness (high or less juicy), taste (sweet or sour), and price (high or cheap).

The experimental design employed in this study utilized an orthogonal method, which maximizes the determinants of the information matrix. This optimal design, introduced by Street et al. (2005), was preferred over a fractional factorial design, as suggested by Tazliqoh (2019), due to its ability to simplify respondent choices by avoiding the need to determine numerous profiles. The use of an orthogonal design

also offers computational advantages, as the formulas for determinants and inverses of information matrices can be easily updated (Goos and Donev, 2003). The experimental design arrangement in this study was conducted using SPSS software to create a combination of attributes comprising eight choice sets with two attribute levels. This facilitated the respondents' selection of various attribute combinations (Bi et al. 2015; Wu et al. 2020).

The DCE model method employed a logistic regression model to estimate the utility value of each attribute. Before applying the DCE method, the orange attributes were combined into two choices across eight questions, from which respondents were asked to select one option. The respondents' choices were then incorporated into the utility equation, following the approach outlined by Louviere et al. (2010):

$$U_{ijk} = V_{ijk} + \epsilon_{ijk}$$

Since researchers do not have access to individuals' actual utilities, the total utility is divided into two components: the systematic or non-stochastic component and the random or stochastic component utility (Kim and House, 2012). The value of  $U_{ijk}$  represents the individual's latent utility for choice set- $i$  and profile alternative  $j$ ,  $V_{ijk}$  is the systematic component of utility for the  $i$ th individual's choice set and the  $j$ th profile alternative, and  $\epsilon_{ijk}$  is the random component of individual utility for choice set- $i$  and alternative  $j$ . Logistic regression analysis is commonly employed to estimate the probability of an event occurring by fitting the data to a logit function. This logit model captures various factors related to the observable characteristics of decision-makers (Alkana and Kudus, 2018).

The determination of attribute values' relative importance in the DCE analysis utilizes the method outlined by Malhotra (2004), which involves the use of utility functions and Multinomial Logit analysis. The utility function can be represented as follows:

$$U(X) = \sum_{i=0}^m \sum_{j=1}^{ni} \beta_{ij} X_{ij}$$

That can be classified with:

$$U_{ij} = \beta_0 + \beta_1 X_{i1j} + \beta_2 X_{i2j} + \dots + \beta_j X_{ipj} + \epsilon_{ij}$$

This formula demonstrates that each attribute is assigned a coefficient  $\beta$  to measure the utility of that attribute. This coefficient provides information on the preference value for each attribute level (Ceschi et al. 2018).

Moreover, the  $\beta$  coefficient for each attribute is used to calculate the consumer's willingness to pay (WTP) (Bi et al. 2015). The WTP calculation involves determining the difference in WTP between two levels of each quality attribute of oranges, assuming that all other quality attributes remain constant, such as price (Gallardo et al. 2014). The WTP value is calculated by dividing the attribute coefficient by the price coefficient, as analyzed by Train (2003). Analyzing WTP is supported by the research of Ceschi et al. (2018), who measure the coefficient of each attribute with a fixed price coefficient. Therefore, in this study, the WTP attribute will be calculated using the formula (Train, 2003; Hole, 2007):

$$WTP \text{ attribute } - j = - \frac{(\beta_j)}{\beta_{price}}$$

Where  $\beta_j$  represents the utility value of the  $j$  profile attribute level, such as the attributes of sweet or sour taste, freshness or lack of freshness, and juiciness or lack of juiciness.  $\beta_{price}$  is the coefficient value of price. After the calculation is performed, it will be determined whether consumers are willing to pay more or not for gerga oranges.

Based on these attributes and calculations, the following hypotheses can be formulated:

- H1: Orange attributes influence consumer preferences.
- H2: Price affects consumers' willingness to pay.

This framework is developed to identify the attributes of oranges that can influence consumer preferences and their willingness to pay for orange attributes at specific levels.

## RESULTS

### Characteristics of Gerga Orange Consumers

The respondents in this study exhibit certain characteristics that align with the demographics of gerga orange consumers. The majority of respondents fall within the 26–35 age range, which represents

the productive age group capable of independently fulfilling their needs (Suripatty and Tantoly, 2019). Consumers in this age range understand the importance of fruit consumption and are more open to purchasing relatively new products in the market. Additionally, the majority of gerga orange consumers are female, consistent with findings from Yasa and Ekawati (2015) that women dominate fruit and household shopping compared to men.

Most gerga orange consumers are located in Bengkulu Province since gerga oranges are predominantly available in traditional markets and fruit outlets within the province. The proximity and strategic location of these outlets provide added value for consumers (Sumarwan, 2002). Similar to the findings of Ceschi et al. (2018), consumers place importance on knowing the origin of the fruit they consume as it contributes to a sense of safety.

The majority of consumers have attained an undergraduate education level. Sumarwan (2002) suggests that education level influences individuals' values, perspectives, and problem-solving abilities. Consumers with higher levels of education are generally more responsive to information and are aware of their needs and the benefits of consuming fruits like grapefruit, which is rich in vitamin C and beneficial for the immune system.

Civil servants make up the majority of the respondents' occupational backgrounds, with the average monthly income falling within the range of  $IDR2,250,000 < Y \leq IDR4,000,000$ . Occupation can also influence consumption patterns, and the respondents' monthly income determines their purchasing power and ability to afford products and services offered by producers. Civil servants, with their stable income, are able to meet their needs as desired (Suripatty and Tantoly, 2019). These characteristics highlight that gerga orange consumers tend to have middle-income levels and a higher level of education.

### Consumer Preference of Gerga Oranges

Consumer preferences were analyzed to assess their desires for improving the quality and presence of domestic oranges in the market. The DCE method was used as the analytical approach, and the analysis was conducted using the STATA tool (Bi et al. 2015). The value and utility obtained reflect the product's ability to

satisfy consumer needs. Utility was assessed based on a combination of fruit attributes, including freshness, water content (juiciness), taste, and price, in order to derive utility results for orange attributes. Evaluating attributes based on sensory perception provides a reliable model for understanding how consumers perceive and react to food products in real-life situations (Lawless and Heymann, 2013). This study focuses on assessing consumer preferences for orange products (Bi et al. 2015). The utility results for the orange attributes are presented in Table 1, indicating positive utility values for freshness, juiciness, and sweet flavor of gerga oranges. Conversely, the negative symbol for the gerga orange attribute indicates consumer preference against that particular attribute. Considering the interactions between attributes helps understand how they influence preferences and whether they are complementary (positive coefficient) or alternative (negative coefficient) to each other (Louviere et al. 2010).

Table 1 reveals that the freshness attribute has the highest utility value (2.321) and is the most preferred attribute. This data suggests that consumers of gerga oranges highly value the freshness of the fruit when choosing gerga oranges. The freshness of gerga oranges is characterized by the tight and smooth skin of the fruit. On the other hand, gerga oranges with wrinkled and dull orange peel are considered less fresh, as indicated by the negative utility value (-2.0697). This analysis demonstrates that consumers prioritize the freshness attribute over other attributes when selecting gerga oranges. The importance of fruit freshness becomes even more significant if consumers intend to store the oranges for a longer period.

Tabel 1. The value of consumer utility to the attributes of gerga orange

Attribute	Coef $\beta$
<b>Freshness</b>	
1. Fresh	2.32149***
2. Less fresh	-2.06974***
<b>Juicy</b>	
1. Juicy	1.23404***
2. Less juicy	-0.94620***
<b>Taste</b>	
1. Sweet	0.76358***
2. Sweet sour	-0.49249***
<b>Price</b>	-0.00248***

Note: \*\*\* $P < 0,001$

The utility of moisture content is the second-highest after freshness based on its utility value. High water content or juiciness of gerga oranges has a utility value of 1.234, indicating that consumers prefer juicier gerga oranges over those with less juice. The amount of water content is related to the perceived freshness level when consuming gerga oranges. Water content is an important attribute for consumers, and gerga oranges, known for their large fruit grains, typically have a high water content. Therefore, gerga oranges with less juiciness are disliked by consumers, resulting in a negative utility value (-0.946).

Fruit taste is an indicator that reveals the quality of the fruit's flavor and is an influential attribute for consumers. Respondents in this study preferred the sweet taste of oranges over the sweet and sour combination. Sweet taste has a positive utility value of 0.763, which consumers appreciate for its refreshing sweetness. Gerga oranges have a unique blend of sweet and slightly sour flavors that provide consumers with a refreshing taste experience. Gerga oranges with a predominantly sour flavor are disliked by consumers, resulting in a negative utility value (-0.492). Therefore, it is important to maintain the flavor of citrus fruits as it falls into the perishable category and requires special handling to preserve its quality. The taste of oranges is closely related to the fruit's ripening process.

Price serves as an indicator for consumers to assess the perceived benefits or product quality. The price is often associated with the perceived benefits by respondents. According to Tjiptono (2005), price plays two main roles in purchase intentions: allocation and information. The allocative role helps consumers allocate their purchasing funds to obtain the highest benefit or utility. In this study, it is observed that the price utility has a negative value (-0.002), indicating that price increases have a negative effect on consumer utility (Ceschi et al. 2018). Consumers are reluctant to buy gerga oranges at a higher price (IDR20,000/kg) as they prefer the lower-priced alternative (IDR15,000/kg). This low utility value reflects consumers' understanding of the quality differences associated with certain price levels.

### **Willingness to Pay of Gerga Orange**

Price is a crucial factor that influences demand and varies depending on the type of goods needed. Consumers derive utility and benefits from the use value of goods and services. Despite limited incomes, consumers are

willing to spend money to obtain satisfaction, benefits, and value from goods and services, selecting products within their affordability (Yusnita, 2010). Generally, consumers are willing to pay more for products that meet their quality needs. Consumer willingness to pay based on the quality attributes of oranges is determined by consumer preferences that prioritize the desired benefits. Table 2 illustrates the amount consumers are willing to pay for gerga oranges with attributes they prefer.

Table 2 demonstrates that consumers are willing to pay IDR936.08/kg more for fresher gerga oranges. Better freshness is associated with higher perceived fruit quality, leading respondents to be willing to pay a premium price. Gerga oranges, characterized by thicker peels, tend to retain freshness for a longer duration. Most gerga oranges available in the market are in a fresh condition as they are predominantly produced locally. This aligns with research by Botelho et al. (2013) on consumers' willingness to pay for local apple varieties in Portugal, which indicates a high valuation of local apples. On average, consumers are willing to pay a premium price for purchasing local oranges. Conversely, gerga oranges that are less fresh have a negative WTP value (-834.57 IDR/kg). This value suggests that the price for less fresh oranges must be lower than that of fresh oranges to be accepted by the general public. The lack of freshness in oranges can be attributed to inadequate storage processes that impact their freshness.

Gerga oranges with higher water content in their juice make consumers willing to pay a higher price of IDR497.59/kg compared to Gerga oranges with lower water content. It is evident that the water content in the juice influences the freshness experienced by consumers when consuming gerga oranges. Adequate water content provides satisfaction and freshness, leading consumers to be willing to pay more for Gerga oranges with higher water content. Gerga oranges are known for their high juice water content, and as a result, consumers are willing to pay a premium price for them. This behavior is attributed to consumers' heightened awareness of fruit characteristics (Botelho et al. 2013). Conversely, Gerga oranges with lower juicy water content have a negative WTP value (-318.53 IDR/kg), indicating that consumers are not particularly fond of less juicy oranges. The lack of juiciness results in a less fresh and bland taste experience for consumers.

Tabel 2. Willingness to pay attributes of gerga oranges

Atribut	Level Atribut	WTP (IDR/kg)
Freshness	1. Fresh	936.08
	2. Less fresh	-834.57
Juicy	1. Juicy	497.59
	2. Less juicy	-381.53
Taste	1. Sweet	307.89
	2. Sweet sour	-198.58

Furthermore, consumers are willing to pay IDR307.89/kg more for a sweeter taste compared to sweet and sour gerga oranges. This finding aligns with the research by Gallardo et al. (2014), which suggests that consumers place a high emphasis on quality attributes such as taste and are willing to pay a premium for products that meet their preferences. Although gerga oranges with a sweet taste can be found in the market, there is room for improvement in terms of consistency, as the taste of gerga oranges can vary among different sources. Gerga oranges with a sweet and sour taste have a negative WTP value (-198.58 IDR/kg). This analysis indicates that consumers do not prefer gerga oranges with a sweet and sour taste and are not willing to pay a higher price for oranges with these attributes.

### Managerial Implications

The managerial implications for cultivators and marketers, based on the findings of this study, involve improving and maintaining the quality attributes of gerga oranges. For cultivators, this can be achieved by harvesting the oranges when they are perfectly ripe to preserve their water content and taste. For marketers, several strategies can be implemented: (1) implementing effective packaging and distribution practices can help maintain the freshness of gerga oranges until they reach consumers, (2) ensuring proper storage handling techniques can extend the shelf life of orange fruits and maintain their quality for a longer duration, (3) establishing standards for the quality attributes of gerga oranges can ensure uniformity in their distribution across the market, (4) and it is crucial to carry out promotional activities through advertising in print and electronic media, such as price catalogs, to increase consumer awareness and generate interest in buying and consuming gerga oranges. Additionally, displaying gerga oranges in large quantities can attract consumers and enhance their visibility.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

The findings of this study reveal that consumers have a preference for fresh oranges with high water content and a sweet taste. They are willing to pay a premium for oranges that possess these quality attributes, with prices reaching IDR936.08/kg for freshness, IDR497.59/kg for juiciness, and IDR307.89/kg for sweetness. On the other hand, consumers are not willing to pay more for oranges that are less fresh, less juicy, or have a sweet and sour taste, and they would only consider purchasing these oranges if there is a discount available.

### Recommendations

In the fresh fruit market, it is crucial to address scratches and damages that can affect the quality of the product and result in economic losses. Evaluating damaged items accurately and avoiding unnecessary profit loss is essential. For cultivators and marketers of Gerga oranges, it is necessary to focus on improving and maintaining the quality of Gerga oranges until they reach the hands of consumers. Additionally, having a fixed and easily accessible location close to consumers is important for ensuring convenience. Cultivators and plantation extension workers should pay special attention to improving fruit attributes to align with consumers' desires and needs. Packaging and transportation should also be given careful consideration, as even minor damages can significantly reduce the value of the oranges. Efforts and resources should be invested in mitigating damage and preventing injury in the first place. It is important to note that retail consumers expect lower prices for damaged oranges. This research has limitations due to the online sampling method, which resulted in uneven distribution of questionnaires within the community. Future research should aim for more accurate sampling, possibly focusing on different attributes such as color and size, and involving a larger population sample.

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