Consumption and Preference of Tropical Vegetables in the Special Region of Yogyakarta

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Abstract. Tropical vegetables are essential food sources for health. However, the consumption of vegetables in the Special Region of Yogyakarta is yet relatively low. Meanwhile, the Special Region of Yogyakarta has the potential to supply vegetable commodities. The research objective is to determine the consumption and consumer preference of the attributes of tropical vegetables. The sample of research locations were purposively selected, i.e., Colombo Market, Kranggan Market, Niten Market, Playen Market, Mirola Kampus, Superindo, and the Agrotechnology Innovation Center (PIAT UGM). The number of respondents was determined by accidental sampling with the survey of 115 respondents. Consumption of tropical vegetables is analyzed descriptively, and consumer preferences are analyzed using the Fishbein analysis. The results showed that the highest to the lowest order of tropical vegetable consumption were purple eggplant, long beans, cucumber, tomato, and chili. In addition, attributes from the preferences of tropical vegetable consumers include freshness, hygiene, convenience, benefits, color, packaging, size, taste, organic, label, and texture. The order of preference for tropical vegetables includes tomatoes, long beans, purple eggplants, chili, and cucumbers.

1. Introduction
Tropical vegetables are essential food sources for health. Vegetables contain fiber, vitamins, minerals, and are mostly low in calories [1]. Another health benefit of consuming vegetables is that they help prevent weight gain by causing satiety, reducing energy intake, and reducing cancer and coronary heart disease [2]; [3]. However, the consumption of vegetables in the Special Region of Yogyakarta is yet relatively low. Consumption of vegetables is only 7.89 percent of the total community food consumption [4]. Meanwhile, the Special Region of Yogyakarta has the potential to supply this commodity. The harvested area of vegetable crops reaches 31.07 percent of the land area of the Special Region of Yogyakarta [4].

Consumers consume tropical vegetables because they have an income that is assumed to be limited because consumers have various needs in their lives. According to [5], the low consumption of household vegetables related to limited income and is very responsive to prices. According to [6], consumption is influenced by price, time constraints, and hedonism attitude. Also, [7] states that consumption is also influenced by the characteristics and goals of consumer consumption, as well as the characteristics and marketing of products.

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Consumer preferences are essential because they are closely related to increased consumption. Preference is choices or something that consumers prefer [8]. Each individual has a choice (choices) in consuming vegetables, assuming maximum satisfaction. According to the study results, [9] showed that the essential attribute in the preference of vegetables is the low hazardous substances, price, and high content of nutritious substances. Besides, preferences are formed from the attributes of goods such as appearance, quality, and price [10]. Based on research [11], consumers prefer vegetables with average size rather than heavy but defects, prefer the quality of standard vegetables, and feel the price on defective products is unfair. [12] states that there are similarities in consumer preferences across research areas and the relevance of product timeframe and food safety attributes in orienting choices.

Given the low but essential importance of vegetable consumption, this study aims to determine the consumption and preferences of tropical vegetables in the Special Region of Yogyakarta. This research is expected to increase consumer satisfaction from preference information so that consumption of tropical vegetables in the Special Region of Yogyakarta can be increased.

2. Method

The study was conducted in the Special Region of Yogyakarta by taking samples from traditional markets—spread across Sleman Regency, Bantul Regency, Gunung Kidul Regency, and Yogyakarta City—and modern markets in Yogyakarta City. The sample locations were purposively selected with the market criteria for selling tropical vegetables (tomatoes, long beans, purple eggplants, chili, and cucumbers), i.e., Colombo Market, Kranggan Market, Niten Market, Playen Market, Mirota Kampus, Superindo, and the Agrotechnology Innovation Center (PIAT UGM).

The study population is the total number of visitors to traditional markets, PIAT UGM, and modern markets in the Special Region of Yogyakarta, whose numbers cannot be identified. Therefore, a sample of 115 respondents was taken by incidental sampling by identifying vegetable buyers in the previously determined markets. The distribution of respondents according to location and type of market is presented in Table 1.

| Market Type       | City/Regency | Market Name    | Total | Percentage (%) |
|-------------------|--------------|----------------|-------|----------------|
| Modern Market     | Sleman       | Mirota Kampus  | 25    | 21.74          |
|                   | Sleman       | Superindo Jalan Kaliurang | 25 | 21.74 |
| **Sub Total**     |              |                | 50    | 43.48          |
| Traditional Market| Sleman       | Colombo        | 15    | 13.04          |
|                   | Yogyakarta   | Kranggan       | 15    | 13.04          |
|                   | Bantul       | Niten          | 15    | 13.04          |
|                   | Gunungkidul  | Playen         | 15    | 13.04          |
| **Sub Total**     |              |                | 60    | 52.17          |
| PIAT              | Sleman       | PIAT-UGM       | 5     | 4.35           |
| **Total respondent** |            |                | 115   | 100.00         |

In the study, validity and reliability tests are carried out on the research instrument used to obtain preference and consumption indicators. The validity and reliability testing were accomplished with SPSS software.
2.1. Validity Test

Testing the validity used is construct validity. Correlation technique used is the product-moment correlation with the formula [13]:

$$r = \frac{N (\sum XY) - (\sum X \sum Y)}{\sqrt{[(N \sum X^2 - (\sum X)^2)[N \sum Y^2 - (\sum Y)^2]]}}$$

where:

- $r$ = Pearson coefficient
- $N$ = number of samples
- $X$ = score of $i$ item
- $Y$ = total score

2.2. Reliability Test

Reliability testing measured by Cronbach Alpha can be calculated using the following formula [13]:

$$\alpha = \frac{\sum_{p \neq q} \text{cor}(x_{pq}, x_{pq}^*)}{p_q + \sum_{p \neq q} \text{cor}(x_{pq}, x_{pq}^*)} \times \frac{p_q}{p_q - 1}$$

where:

- $P_q$ = number of items/indicators
- $q$ = indicator block

Consumption is analyzed descriptively about the purpose and amount of consumption. Consumer preferences for tropical vegetables were analyzed using a Fishbein multiple attributes approach analysis. According to [14], the multi-attribute attitude model explains that consumers’ attitudes towards an object (product or brand) are primarily determined by consumers’ attitudes towards the attributes evaluated. The attributes of tropical vegetables used in this study consisted of size, color, packaging, label, texture, taste, organic, benefits, convenience, and hygiene. This model uses the following formula [15]:

$$A_o = \sum_{i=0}^{n} b_i e_i$$

where:

- $A_o$ = attitude towards the attributes of tropical vegetables
- $b_i$ = favorite belief (strength of belief) that tropical vegetables have the attribute $i$
- $e_i$ = Evaluate the importance of tropical vegetables from attribute $i$
- $i$ = 1 to 11 indicates the attribute
3. Result and Discussion

In this study, the validity and reliability tests were conducted prior to analysis. Based on the validity test using the Pearson correlation, it is known that the significance value of the attributes of size, color, packaging, label, texture, freshness, taste, organic, benefits, convenience, and hygiene of tropical vegetables was smaller than 0.10. That is, all attributes in the preference variable are valid. Also, the Cronbach alpha value of preference variables on cucumber, long bean, purple eggplant, chili, and tomatoes is greater than 0.6. It shows that the preference variables for the five commodities are reliable.

3.1. Consumer Characteristics of Tropical Vegetables

Characteristics of tropical vegetable consumers are described with several variables, i.e., gender, age, marital status, education, and type of work (Table 1). Consumers in this study are buyers of tropical vegetables in various modern and traditional markets. Judging from the gender, it turns out that in the Special Region of Yogyakarta, households that do shopping activities to the market are women, which illustrates that shopping is a domestic task. The task of shopping to the market becomes the duty of women in patriarchal families (Javanese families) as the domestic domain, while men carry out activities in the public domain [16]. Also, there are 2.6% of men doing shopping activities with shopping places in the modern market because image shopping in the modern market is clean.

The average consumer is at a productive age. The youngest consumer is aged 22 years, and the oldest is 69 years, indicating that the age of buyers of tropical vegetables is widely varied. The habit of consuming vegetables occurs in consumers, both those who are married and those who are not married. Consumers with a married status need to provide food for the family, while those who are not married to meet their own needs — consumer with the status of not married do not have dependents of family members.

Various education levels also consume tropical vegetables from those with low education to those with high education. Education is relevant to consumers’ knowledge of nutrition fulfillment. The majority of vegetable consumers have more than 12 years of education (high school and above). Viewed from the type of work the vegetable consumers have a job (75.7%), the rest are housewives who get spending money from their husbands and or other household members who work.

Table 2. Profile of tropical vegetable consumers in the Special Region of Yogyakarta

| Profile             | Total (n=115) | Percentage (%) |
|---------------------|--------------|----------------|
| Gender:             |              |                |
| Male                | 3            | 2.61           |
| Female              | 112          | 97.39          |
| Age (year):         |              |                |
| Mean                | 39.08        |                |
| Standard deviation  | 12.05        |                |
| Minimum             | 22           |                |
| Maximum             | 69           |                |
| Marital status:     |              |                |
| Single              | 20           | 17.39          |
| Married             | 95           | 82.61          |
| Education (year):   |              |                |
<12 45 39.13  
(13-16) 62 53.91  
>16 8 6.96  
Mean 13.90  
Standard deviation 3.00  

Type of work:  
Civil servant 10 8.70  
Employees 37 32.17  
Trader 2 1.74  
Entrepreneur 28 24.35  
Housewife 28 24.35  
Student 9 7.83  
Farmer 1 0.87  

Characteristics of tropical vegetable consumers are productive ages that are still strong in carrying out activities. Activities related to spending on family needs are carried out by women because they are domestic work with a high level of education and have jobs to have their income from work or income from other household members.

3.2. Household Income and Expenses

Tropical vegetable consumers in the Special Region of Yogyakarta have an average household income higher than the basic need to live, i.e., Rp 1,570,923 per month [17]. Based on table 2, it is known that all households earn a living. Based on the type of market, consumers who shop at traditional markets have the lowest income compared to other markets. In contrast, consumers of PIAT-UGM have the highest household income and are followed by consumers who shop in the modern market. Variation in consumer income in the modern market is very high because shopping time at the supermarket is more flexible with supermarket hours longer, from morning to night compared to shopping time at traditional markets and PIAT-UGM (limited) usually only until noon. If explored further though consumers in the modern market, they also shop at traditional markets/stalls, and vice versa.

Table 3. Average household income by market type

| Market Type      | Household income (Rp/month) | Standard Deviation | Min     | Max       |
|------------------|-----------------------------|--------------------|---------|-----------|
| Modern Market (n=50) | 6,084,127                   | 5,026,249          | 1,000,000 | 25,000,000 |
| Traditional (n=60) | 4,552,500                   | 4,071,775          | 600,000  | 20,000,000 |
| PIAT-UGM (n=5)    | 7,610,000                   | 3,370,534          | 3,800,000 | 12,000,000 |
| Total (n=115)     | 5,351,359                   | 4,542,359          | 600,000  | 25,000,000 |

Household expenditure is the amount of expenditure for food and non-food needs required to fulfill the living needs. The average expenditure per month is Rp 3,229,390.00, with food expenditure of around 29.58% and non-food at 49.01%. It means that the proportion of food and non-food is almost balanced. Consumer household expenditure is smaller than household income so that routine household needs can still be met from household income.
Table 4. Average household food and non-food expenditure by market type

| Market Type            | Expenses (Rp/month) | Food | Non-Food | Total   | Standard Deviation |
|------------------------|---------------------|------|----------|---------|--------------------|
| Modern Market (n=50)   | 1,873,800           | 1,916,200 | 3,790,000 | 3,380,028 |
| Traditional Market (n=60) | 1,296,943        | 1,436,399 | 2,731,332 | 2,223,889 |
| PIAT-UGM (n=5)         | 2,126,200           | 1,473,800 | 3,600,000 | 2,635,539 |
| Total (n=115)          | 1,582,756           | 1,646,634 | 3,229,390 | 2,835,124 |

Table 5. Average food expenditure by consumption type

| Consumption Type       | Food Expenditures (Rp/month) | Standard Deviation | Percentage Food Expenditures (%) |
|------------------------|------------------------------|--------------------|----------------------------------|
| Staple food:           |                              |                    |                                  |
| Rice                   | 188,872                      | 182,933            | 11.93                            |
| Others                 | 91,098                       | 262,908            | 5.76                             |
| Sub Total              | 279,970                      |                    | 17.69                            |
| Other:                 |                              |                    |                                  |
| Side dishes            | 571,087                      | 497,541            | 36.08                            |
| Vegetable              | 236,678                      | 178,357            | 14.95                            |
| Seasoning              | 112,596                      | 72,773             | 7.11                             |
| Drinks                 | 87,686                       | 95,585             | 5.54                             |
| Others                 | 294,739                      | 335,300            | 18.62                            |
| Sub Total              | 1,302,786                    |                    | 82.31                            |
| Total                  | 1,582,756                    | 1,017,567          | 100.00                           |

The amount of one-time purchase of tropical vegetables shows a variable amount due to the nature of the relationship between one vegetable and one that can complement each other or substitute one another except for cucumbers and tomatoes. The lowest purchase is for chili because it is usually consumed with chili or as a complimentary item with a relatively small proportion compared to other vegetables. The highest consumption is purple eggplant because it can be served with long beans and cooked in various types of food with tomatoes—besides, chili with a composition of dishes that require more purple eggplants. Thus, the amount of vegetable consumption per purchase depends on the type of cuisine to be made.

3.3. Consumption of Tropical Vegetables

The consumption goal of consumers is due to planning (99%). The plan is made based on family orders (100%). Consumers buy tropical vegetables because they are favorite vegetables from family members (99%) and make variations of dishes (1%). Consumption, consumption frequency, purchase price, and consumer rating on prices tropical vegetables can be seen in Table 6.

Table 6. Consumption dan purchase price tropical vegetables

| Description             | Cucumber | Long Bean | Purple Eggplant | Chili | Tomato |
|-------------------------|----------|-----------|-----------------|-------|--------|
| Consumption (kg/purchase)| 0.56     | 0.64      | 0.80            | 0.33  | 0.54   |
| Consumption frequency (times/month)| 5.22     | 5.67      | 6.54            | 20.43 | 13.21  |
Purchase price (Rp/kg):

|                        | Modern market | Traditional market | Vegetable seller/stall | Combination | PIAT-UGM | DIY average |
|------------------------|---------------|--------------------|------------------------|-------------|----------|-------------|
|                        | 9,750         | 11,909             | 9,142                  | 72,916      | 11,375   | 8,132       |
|                        | 7,867         | 11,568             | 7,879                  | 67,767      | 7,178    | 7,879       |
|                        | 7,404         | 10,444             | 7,333                  | 74,000      | 7,357    | 7,333       |
|                        | 8,740         | 10,066             | 8,305                  | 88,709      | 10,050   | 8,740       |
|                        | 5,000         | -                  | -                      | -           | -        | -           |
|                        | 8,132         | 10,972             | 7,878                  | 74,825      | 8,416    |             |

Consumer ratings on prices (%):

|                     | Very cheap | Cheap   | Neutral | Expensive | Very expensive |
|---------------------|------------|---------|---------|-----------|---------------|
|                      | 5.30       | 34.50   | 38.90   | 20.40     | 0.90          |
|                      | 0.90       | 33.00   | 54.80   | 9.6       | 1.80          |
|                      | -          | 32.20   | 54.80   | 13.00     | -             |
|                      | -          | -       | 19.30   | 24.60     | -             |
|                      | -          | -       | 51.30   | 11.30     | -             |
|                      | -          | -       | -       | 47.40     | 0.90          |

Even though chili's purchase was low per one time, it turned out that the frequency of purchases was the highest in a month. Chili and tomatoes can complement each other and function as flavorings in various dishes. On the other hand, cucumbers and long beans are low in purchasing frequency because cucumbers function as fresh vegetables and long beans to complement other vegetables.

The purchase price in the modern market is higher compared to traditional markets and vegetable vendors/stalls. Besides, buyers who make purchases in different combinations of shopping places also pay a higher price than traditional markets and vegetable vendors. At the time of the study, chili's price was very high, and fluctuations in the price of chili between time (rainy season and dry season) were also the highest compared to other commodities. However, cucumbers' purchase price, purple eggplants, long beans, and tomatoes are not different. Only the purchase price of purple eggplants in various markets is the lowest compared to the three commodities. It can be due to the sustainable demand for chili extreme price fluctuations throughout the year [18]. Purchase price information at PIAT UGM can only be obtained for cucumbers at a lower price than other markets. It was the only product and PIAT UGM as producer and seller, so there was no margin in this supply chain.

Consumer responses to the purchase price of chili tend to be expensive compared to other commodities. However, the frequency of purchases is high, even with a small amount in one purchase. That is, consumers buy according to the amount needed given the price is high. Chili is always available in any market because of its function as a food flavor that consumers consider essential. Consumer responses to the purchase price of other commodities tend to be very cheap and considered expensive because the purchase price in the modern market and the modern market's purchase price for all commodities are more expensive.

Willingness to pay for all commodities is lower than the price paid (purchase price). It indicates that consumers want the price of vegetables cheaper than market prices. Consumers desire the highest price reduction for chili in addition to purple eggplants and long beans. Meanwhile, the price of the commodity that best suits the desires of consumers is cucumber. Most consumers like to consume tomatoes, chili, and purple eggplants. Simultaneously, vegetables that are not popular are cucumbers because there are still types of vegetable substitutes for cucumbers such as basil, cabbage, young forehead, tomatoes, and others in the tropics. Chili is the preferred type of tropical vegetable, followed by cucumbers, tomatoes, purple eggplants, and long beans.
3.4. Preference for Tropical Vegetables

Consumers’ preferences for tropical vegetables are analyzed using Fishbein analysis by describing consumers’ attitudes towards 12 attributes of tropical vegetables, seen from the aspects of interests and importance in consuming tropical vegetables. In consumers’ interest in tropical vegetables, the five most preferred commodities are the freshness attribute and the least preferred texture attribute of tropical vegetables. It is known that tropical vegetables in the modern market and the traditional markets cannot last long, perishable product. In purchasing tropical vegetables, freshness is a consumer priority. In contrast, many consumers perceive that a product with a non-smooth texture is a healthier product because of the small use are chemicals during cultivation. Based on perceptions of the 12 attributes of the five commodity sequences, the commodities that have a preferred tendency are tomatoes, purple eggplants, chili, long beans, and the least preferred one is cucumber. Besides liking the freshness attribute, the consumers’ favorite in the five tropical vegetable commodities also likes the benefits, ease of obtaining, and the hygiene of tropical vegetables. It is related to their profile that most of them were educated. Thus, consumers have realized the need for food quality and safety, not only for food security. This favorite aspect of confidence can be one of the considerations for producers and traders in developing their business because producers and traders can improve their products’ quality so that demand from tropical vegetable commodities will be higher.

Table 7. Consumer evaluation of interest attributes for tropical vegetables

| Attribute     | Cucumber | Long Bean | Purple Eggplant | Chili | Tomato | Average |
|---------------|----------|-----------|-----------------|-------|--------|---------|
| Size          | 3.06     | 3.15      | 3.25            | 3.27  | 3.35   | 3.22    |
| Color         | 3.00     | 3.14      | 3.50            | 3.42  | 3.51   | 3.31    |
| Packaging     | 3.25     | 3.45      | 3.27            | 3.28  | 3.36   | 3.32    |
| Label         | 3.03     | 3.06      | 3.08            | 3.06  | 3.17   | 3.08    |
| Texture       | 2.94     | 3.04      | 3.03            | 3.00  | 3.06   | 3.01    |
| Freshness     | 4.38     | 4.26      | 4.38            | 4.33  | 4.40   | 4.35    |
| Taste         | 3.22     | 3.12      | 2.80            | 3.07  | 3.33   | 3.11    |
| Organic       | 3.02     | 3.09      | 3.14            | 3.18  | 3.16   | 3.12    |
| Benefits      | 4.19     | 3.99      | 4.01            | 3.74  | 4.38   | 4.06    |
| Convenience   | 4.06     | 4.23      | 4.24            | 4.17  | 4.38   | 4.22    |
| Hygiene       | 4.27     | 4.20      | 4.27            | 4.26  | 4.36   | 4.27    |
| Average       | 3.49     | 3.52      | 3.54            | 3.53  | 3.68   | 3.55    |

The description of consumer preferences from the importance of tropical vegetables’ attributes can be described as what vegetable attributes are considered essential and are not considered necessary by consumers. This study found that the consumption preferences of the aspects of the importance of the five tropical vegetable commodities studied were considered very important, namely the freshness of tropical vegetables. Three other attributes that are also important are hygiene, ease of obtaining, and benefits of consuming tropical vegetables.

In general, the attributes of the five tropical vegetable commodities that are not considered important in determining consumer preferences in terms of importance are the tropical vegetable label attributes. It means that consumers do not prioritize the labeling carried out by tropical vegetable sellers. Labels, especially in traditional markets, do not yet exist. Even in modern markets, there are few, and the prices are relatively more, so consumers are not familiar with labeled products. In
addition to the label attributes, for each commodity, the 11 different attributes are not considered essential; for example, consumer cucumber purchases do not concern the size, color, and texture of tropical vegetables. For long beans, the color attribute and whether the product is considered organic is not necessary. The texture and taste attributes of purple eggplants are not considered necessary by consumers, whereas consumers ignore the texture attributes for chili and tomatoes.

The description of the results of the study found that consumers’ preferences from the aspect of importance to cucumber and purple eggplant tropical vegetables were not many attributes required in the purchase. Simultaneously, the other three commodities were long beans, chili, and tomatoes as vegetable considerations of consumers in their preferences with different importance attributes differently. However, based on research [12], the consumption preference attributes are relatively the same in different locations. Therefore, producers and traders can make these preference attributes to improve the quality of the products offered because, according to [19], preferences become factors that affect consumption. It will encourage consumers to increase the amount purchased in modern, traditional dan PIAT UGM markets.

### Table 8. Consumer evaluation of essential attributes for tropical vegetables

| Attribute       | Cucumber | Long Bean | Purple Eggplant | Chili  | Tomato | Average |
|-----------------|----------|-----------|-----------------|--------|--------|---------|
| Size            | 2.93     | 3.21      | 3.11            | 3.19   | 3.24   | 3.14    |
| Color           | 2.92     | 3.16      | 3.36            | 3.35   | 3.44   | 3.25    |
| Packaging       | 3.20     | 3.37      | 3.19            | 3.21   | 3.30   | 3.25    |
| Label           | 2.87     | 2.96      | 2.93            | 2.90   | 2.96   | 2.92    |
| Texture         | 2.93     | 3.01      | 2.98            | 3.00   | 3.05   | 2.99    |
| Freshness       | 4.48     | 4.42      | 4.47            | 4.22   | 4.45   | 4.41    |
| Taste           | 3.29     | 3.30      | 2.83            | 3.16   | 3.33   | 3.18    |
| Organic         | 3.00     | 3.10      | 3.07            | 3.15   | 3.14   | 3.09    |
| Benefits        | 4.02     | 3.85      | 3.76            | 3.62   | 4.25   | 3.90    |
| Convenience     | 4.24     | 4.17      | 4.20            | 4.00   | 4.27   | 4.18    |
| Hygiene         | 4.24     | 4.26      | 4.26            | 4.32   | 4.38   | 4.29    |
| Average         | 3.47     | 3.53      | 3.47            | 3.47   | 3.62   | 3.51    |

The description of consumer preferences from their attitudes towards the five tropical vegetables, both viewed from the aspect of interests and importance beliefs, shows that the freshness of tropical vegetables is the preferred choice for consumers’ vegetable attributes. Nevertheless, consumers in consuming tropical vegetables do not pay attention to their texture and do not prioritize tropical vegetables labeling and purchasing. Consumers’ attitudes towards the aspects of the beliefs of interest and importance of tropical vegetables can explain consumer preferences for tropical vegetables.

Consumer preference for consuming the five organic vegetables is on freshness attribute, and another attribute, which is also his preference is a hygienist. Ease and benefits and consumers are not preferable to textures and labels. At the same time, the order of preference in commodities is not so evident because the value of commodity preference scores is almost the same when viewed in detail consumers’ preferences for tomatoes. After all, tomatoes can be consumed with four other vegetables, its function as a complementary of other vegetable commodities, followed by purple eggplant long beans, chili, and cucumber.
Table 9. Consumer preferences attributes of tropical vegetables

| Attribute  | Cucumber | Long Bean | Purple Eggplant | Chili | Tomato | Average | Ranking |
|-----------|----------|-----------|-----------------|-------|--------|---------|---------|
| Size      | 9.25     | 10.30     | 10.43           | 10.80 | 11.17  | 10.39   | 7       |
| Color     | 9.02     | 10.90     | 12.17           | 11.92 | 12.42  | 11.29   | 5       |
| Packaging | 10.78    | 11.87     | 10.80           | 10.86 | 11.34  | 11.13   | 6       |
| Label     | 9.03     | 9.30      | 9.42            | 9.37  | 9.72   | 9.37    | 10      |
| Texture   | 8.80     | 9.27      | 9.22            | 9.17  | 9.40   | 9.17    | 11      |
| Freshness | 20.22    | 19.12     | 20.10           | 18.65 | 19.87  | 19.59   | 1       |
| Taste     | 11.02    | 10.72     | 8.58            | 9.96  | 11.55  | 10.37   | 8       |
| Organic   | 9.42     | 9.82      | 9.98            | 9.98  | 10.22  | 9.88    | 9       |
| Benefits  | 17.46    | 15.94     | 15.73           | 14.49 | 18.97  | 16.52   | 4       |
| Convenience | 17.65  | 17.97     | 17.18           | 17.23 | 19.00  | 17.81   | 3       |
| Hygiene   | 18.54    | 18.37     | 18.70           | 18.97 | 19.42  | 18.80   | 2       |
| Average   | 12.84    | 13.05     | 12.94           | 12.85 | 13.92  |         |         |
| Ranking   | 5        | 2         | 3               | 4     | 1      |         |         |

4. Conclusion

The highest to the lowest tropical vegetable consumption order were purple eggplant, long beans, cucumber, tomato, and chili. Moreover, the order of attributes of tropical vegetable consumer preferences is freshness, hygiene, convenience, benefits, color, packaging, size, flavor, organic, label, and texture. The order of preference for tropical vegetables includes tomatoes, long beans, purple eggplants, cayenne peppers, and cucumbers. Thus, increasing the competitiveness of tropical vegetables can be done by modifying preference attributes to increase people’s consumption of vegetables.

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