THE IMPORTANT ATTRIBUTES OF LOCAL AND IMPORTED APPLE: A FACTOR ANALYSIS APPLICATION

Atribut Penting Apel Lokal dan Impor : Aplikasi Analisis Faktor

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ABSTRACT

This study aims to find the important attributes of local and imported apple. A consumer survey was conducted in Java Island representated by four big cities: Malang, Surabaya, Yogyakarta, and Bandung. Three categories of purchasing place at each city are supermarket, fruit stall and traditional market. Accidental sampling was done to choose the samples of consumer. The total respondents interviewed was 240 consumers consisting of 120 for each attribute. The data of apple attributes and purchasing place were analyzed by exploratory factor analysis supported by SPSS software. The result suggests that the important quality attributes of local and imported apples are grouped in each two latent factors namely quality and cultivar. Meanwhile, purchasing place is grouped in one latent factor. All quality attributes of local and imported apples have positive correlation with the apple quality, but there is a different finding in which apple flavor of local and imported apples are not the most important attribute that ranked first based on consumer assessment. The factor of apple cultivar always associates with the apple size, both on local and imported apples. Rome Beauty (local apple) and Fuji (imported apple) have greater average size than other cultivars. Thus, these attributes are already attached one another. The factor of purchasing place becomes an important part which accompanies the apple's quality attributes and is considered by consumers in purchasing apple.

Keywords: *factor analysis, imported apple, local appl, quality attribute*

INTISARI

Penelitian ini bertujuan untuk mendapatkan atribut-atribut penting apel lokal dan impor. Survei konsumen dilakukan di Pulau Jawa yang diwakili oleh empat kota besar, yakni Malang, Surabaya, Yogyakarta, dan Bandung. Sampel konsumen di masing-masing kota ditentukan dengan accidental sampling pada tiga kategori tempat pembelian yakni supermarket, kios buah, dan pasar tradisional,.Jumlah total responden yang diwawancarai sebanyak 240 konsumen, terdiri dari masing-masing 120 konsumen apel lokal dan 120 konsumen apel impor. Data atribut apel

dan tempat pembelian dianalisis dengan exploratory factor analysis, yang didukung dengan software komputer SPSS. Hasil penelitian menunjukkan bahwa atribut penting kualitas apel lokal dan impor masing-masing berkelompok dalam dua faktor latent, selanjutnya disebut kualitas dan kultivar. Sedangkan tempat pembelian berkelompok dalam satu faktor latent. Semua atribut kualitas apel lokal dan impor mempunyai korelasi positif dengan kualitas apel, namun ada temuan yang berbeda yakni atribut rasa apel lokal dan impor bukan merupakan atribut yang paling penting yang berada pada ranking teratas menurut penilaian konsumen. Faktor kultivar apel selalu berkaitan dengan ukuran apel, baik pada apel lokal maupun apel impor. Kultivar Rome Beauty pada apel lokal, dan Fuji pada apel impor mempunyai ukuran rata-rata yanb lebih besar daripada kultivar lainnya, jadi atribut-atribut ini telah melekat satu dengan yang lain. Faktor tempat pembelian menjadi bagian penting yang menemani atribut kualitas apel dan dipertimbangkan oleh konsumen dalam pembelian apel.

Kata kunci: *analisis faktor, apel impor, apel lokal, atribut kualitas*

INTRODUCTION

Lancaster (1966) suggested a new approach to consumer theory. According to him, it each good has intrinsic properties that are relevant to the theory of consumer. Traditional consumption theory is unable to explain consumer reactions to a new commodity and quality's variation. Lancaster (1966) developed an assumption that consumption is an activity that uses the goods as inputs and a collection of characteristics as the output.

The Lancaster theory has become an important base in developing hedonic demand analysis so called hedonic price. It is defined as the implicit price of the attributes and disclosed to represent the economic value of the observed prices within differentiated products and the specific number of related characteristics (Rosen, 1974). Price, p(z) = p (z1, z2, …, zn) is defined as each point on a plane and guide the locational choice of consumers and producers with regards to the characteristic of package which is purchased and sold (Rosen, 1974).

Since Lancaster (1966) suggested a new approach to consumer theory, the attributes of the product become an important part of the study on consumer behavior. The approach on product attributes was further developed by Rosen (1974) stated that the quality attributes of the product affect the price. Therefore, the product's price is not only affected by supply – demand performance as it is

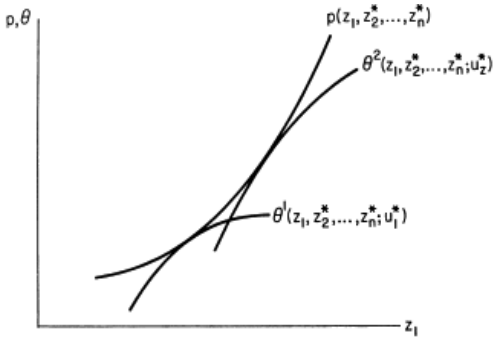

Figure 1. Consumers' Equilibrium on Hedonic Price (Rosen, 1974)

explained by the classical economic theory but also affected by its attributes.

Figure 1 describes consumers' equilibrium on hedonic price. The consumer's willingness to pay for z at the utility index and fixed income is θ(z; u, y) while p(z) is a minimum price that should be paid in the market. The utility will be maximum when θ (z* ; u* , y) = p(z*) and θ_{zi} (z* ; u* , y) = p_i (z*), i = 1, … , n, where z* and u* are optimum. An optimum location on z happens when p(z) and θ (z* ; u* , y) are the connected tangent of both variables. One dimension of consumer's equilibrium is illustrated on figure 1. One family of indifference curve, where there is only one member (on u*), is defined as θ (z_1, z^*_2, … , z^*_n ; u, y). Two different buyers are shown in the figure, i.e. θ^1 and θ^2. The last buyer buys one merk offering more z_1. The increasing income always increases the maximum utility that coould be reached. Therefore, if p(z) convect and regular enough at any places, the higher-income consumers are expected to buy more number of all characteristics (Rosen, 1974).

It is the time that agribusiness actor pays attention to the importance of the attribute values according to consumer's assessment. One of the benefits of attributes value is for analyzing hedonic price, an implicit price that is affected by the product's attributes.

Several previous studies have found the important quality attributes of apple fruits, as shown in Table 1. This study added and modified some attributes. Firstly, this study modifies the apple's size to weight, since it is more measurable. The apple's weight is measured from the volume of apples bought by consumers divided by the number of apples. Secondly, this study does not use price as the attribute because the price is used as the dependent variable of a hedonic price on the next study. Thirdly, this study uses origin (local and imported) as the compared object. Fourhtly, we add juiciness attribute. Fifthly, the factor analysis includes purchasing place because it will influence the apple price.

Table 1. Apple Attributes Investigated by Previous Studies

Researcher & year	Attributes
Manalo (1990)	size, flavor, price, color, crispness
Péneau, *et al* (2006)	size, flavor, appearance, aroma, freshness, cultivar, organic
Rahayu, *et al* (2012b)	size, price, color, texture, sponge nets packaging
Skreli & Imami (2012)	size, varieties/cultivar, apple origin (local and imported)
Widyadana, *et al* (2013)	size, flavor, appearance, color, crispness, aroma, hygiene
Moor *et al.* (2014)	flavor, price, appearance, health benefits
This study	size (weight), flavor, appearance, cultivar, texture, aroma, freshness, juiciness. We include purchasing place in the analysis

Various previous studies on hedonic price meassure the attributes directly without

any preliminary analysis [Carew (2000), Huang & Lin (2007), Carew *et al* (2012), Schollenberg (2012), Gurung, 2013)]. Although searching of previous studies has been done, it is possible that the attributes referenced are not relevant to the condition of the investigated products. This research uses factor analyis to the attributes elaborated from previous research and field of studies. The reduction result from factor analysis is expected to find the important attributes that will be implemented in the next step, hedonic price analysis on local and imported apple.

Statistical analysis that can be used to reduce many attributes is few. The important attributes are factor analysis and principal component analysis (Field & Miles, 2010). Factor analysis has been applied to some previous studies to analyze the quality attributes of fruits and food. Widyadana, *et al* (2013) used factor analysis to analyze the perception on quality attributes of local and imported apples in terms of size, color, appearance, aroma, hygiene, crispness, flavor and hygiene. Subsequently, Denver & Jensen (2014) used principal factor analysis to group 14 variables of apple, but obtained only two factors. While the application of PCA in determining the attributes of fruit and food have been used by Péneau *et al*. (2006); Moor, *et al.* (2014); and Denver & Jensen (2014). Meanwhile, previous studies used conjoint analysis to analyze products' attributes of consumer preferences. Conjoint analysis was used by Manalo (1990); Skreli & Imami (2012b); and Rahayu, *et al* (2012b).

This study aims to find the important attributes of local and imported apple. The attributes are useful in determining the hedonic price that will be analyzed in the next stage. The extraction method used in factor analysis is principal component factors. Beside apple attributes, we include the purchasing place in the analysis. We are sure that purchasing place will influence the apples' quality attributes. They are different in every category of purchasing place.

METHODS

The study used survey method conducted in four major cities (following the information from local apple traders) in Java, namely: Malang, Surabaya, Yogyakarta, and Bandung. Malang was choosen as it represents the location nearby local apple production areas. Surabaya is the biggest city in East Java. And then, Yogyakarta represents a big city in the central part of the islan. Bandung represents a big city in Western Java. In addition, local apple is delivered to these four cities regularly in large quantities. Therefore, apple marketing chain can be traced coherently according to the rules of snowball sampling.

In each city, we conducted a consumer survey at three categories of purchasing place: supermarkets, fruit stall, and traditional markets. At each point of

purchasing place, the number of samples were predetermined into ten consumers of both local apples and imported apples. Consumer at each purchasing place was chosen by applying accidental sampling. The total number of consumers interviewed in each city were 30 for each type of apple consumer. Thus, total number of respondents in the four cities were 120 local apples and 120 imported apple consumers. Those number has over the minimum sampling requirement. Based on the attributes analyzed by factor analysis (9 attributes), the minimum respondent numbers are 90 per apple consumer type. Recommended number of respondents to factor analysis is between 5 to 10 participants per variable up to a maximum of 300 participants, so that the test parameters tend to be stable (Kass and Tinsley, 1979 in Field & Miles (2010).

Accidental sampling or also called convenience sampling is a technique in which samples were taken as part of the population that is easily found (Bhattacherjee, 2012). In this study, accidental sampling was used in determining consumer sample who purchased the apple, since there is no information about their population data, it is not possible to do with probability sampling.

Important attributes on local and imported apples are found by exploratory factor analysis. The two category of apple origin, namely local and imported analyzed separately. Formulae of a factor is mentioned below (Field & Miles, 2010):

$$Y_i = b_1X_{1i} + b_2X_{2i} + \ldots + b_nX_{ni} + \varepsilon_i \ldots\ldots (1)$$

Y_i is the founded factor, with the breakdown of variable 1.1 to 9.2 listed in Table 2. Loading factor (b_1 to b_n) is the correlation between variable with the factors. Formulation of all factors are the same, however, variables which have too small loading are excluded from the factors.

The significant factor is determined by the eigenvalue. If one factor has eigenvalue > 1, it means that the factor significant as a group of apple attributes. A significant factor is composed of a number of variables (attributes). The steps of factor analysis are 1) the preparation of a correlation matrix, 2) extraction to get factors with eigenvalues more than one, and 3) rotation to draw up a factor matrix and variables in the diagonal form. Technically, factor analysis is done by using SPSS software.

In the whole study, all attributes in the significant factors are then used as the attribute on hedonic price analysis. However, this paper specifically discusses the important factors in which apple's quality attributes grouped. Measurement of attributes (except the size and price) is done with Likert scale ranges from 1 to 5 with general details as follows:

Score 1: strongly disagree

Score 2: disagree

Table 2. The Attributes of Local and Imported Apple

Attribute	Attributes level	Explanation
Cultivar	LOCAL APPLE: Manalagi (Dummy 1) Rome Beauty (Dummy2) Anna IMPORTED APPLE: Fuji (Dummy 1) Washington (Dummy 2) Others	Purchased cultivar (local and imported apples are analyzed separately)
Flavor	Very sour up to very sweet	Consumers' assessment flavor
Aroma	Very un-smell up to very smell	Consumers' assessment on aroma
Juiciness	Very small up to very much	Consumers' assessment on juiciness
Freshness	Very unfresh up to very fresh	Consumers' assessment on freshness
Texture	Very hard up to very crispy	Consumers' assessment on texture
Size (weight)*	in the scale of ounce	Apple's weight per fruit (ounce)
Appearance	Very un-smooth up to very smooth	Consumers' assessment on appearance

*Apple size is measured in weight per fruit, it is counted from total weight of apple purchased divided by its number.

Score3: hesitation

Score 4: agree

Score 5: strongly agree

Measurement with Likert scale needs validity test of the research instrument. Validity is the consistency of the measurement result. However, the only consistency is not enough (Churchill, 1979); the valid instrument is able to measure what is being measured. Pearson correlation could be used to test the validity of the instrument, by using the correlation coefficient between each value on one question with the total value of all questions (Sanusi, 2015).

We also do reliability test. Reliability is a consistency of measurement in reflecting the measured construct (Field & Miles, 2010). This research uses Cronbach α to test the data reliability. The Cronbach α value is counted with formulae (2).

$$\alpha = \frac{N^2\overline{Cov}}{\sum s^2_{item} + \sum Cov_{item}} \quad \text{..... (2)}$$

Source: Field & Miles (2010)

Lower alpha shows that the sample items have a lower ability in capturing the construct measured. In the opposite, higher alpha shows that the k item is closely correlated with the right value (Churchill, 1979). It is generally agreed that the alpha value > 0.7 indicated that the data is reliable.

RESULTS AND DISCUSSION

This section describes the consumers of local and imported apple, reliability and validity of data, the result of factor analysis, and discussion.

Consumers Description

The cultivar of Manalagi and Rome Beauty are dominant in the market of local apple. A number of consumers who buy Manalagi cultivar are only 5% more than them who buy RB cultivar. While consumers who buy Anna cultivar are only a small part of the total consumers. This result shows the consumer preference on local apple cultivars. In addition, the information from farmers and traders also shows the sequence of apple volume produced by farmers and marketed by traders from Manalagi, RB, and Anna respectively.

The most consumers of imported apple bought Fuji cultivar. Their number is quite dominant, more than fifty percent. Fuji cultivar is the most widely purchased by consumers in the three categories of purchasing place. Meanwhile, other cultivars are purchased by only a few consumers. The results of previous studies in Surabaya also stated that the number of buyers who buy Fuji and Washington cultivars was 75% of their respondents of imported apple buyers (Widyadana et al., 2013). In the imported apple, the proportion of consumer is not related to the production number, however, it is

Table 3. The Number of Consumers Who Buy Apple Cultivars In Various Categories of Purchasing Place

	Cultivar of local apple			Cultivar of imported apple		
Purchasing place	Manalagi	Rome Beauty	Anna	Fuji	Washington	Others
Supermarket	23	17	0	18	7	15
Fruit stall	17	21	2	26	9	5
Trad.market	21	16	3	19	15	6
Total	61	54	5	63	31	26
Percentage*	50,8	45,0	4,2	52,5	25,8	21,7

* Percentage is counted for each category of local and imported apple

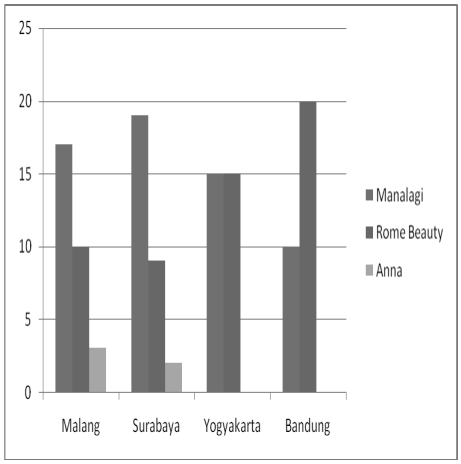

Figure 2a. Local apple cultivar based on city

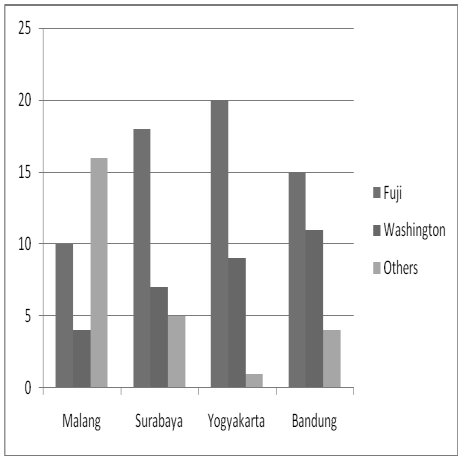

Figure 2b. Impoted applecultivar based on city

linked to consumer preferences and price of apples. Some imported apple cultivars have more expensive price (more than Rp 50,000 per Kg) so that they are bought by a few consumers. For example, cultivars Envi Scilate NZ and Wangshan have a premium price of Rp 68,800 and Rp58,500 per kilogram.

We can also describe consumers in the various city based on apple cultivars boughed (Figure 1 and Figure 2). We found that there is a different consumers' preference, especially on the apple cultivar. On local apple, generally, consumers prefer cultivar of Manalagi, except them in Bandung (Figure 1). Consumers in Bandung prefer cultivar of Rome Beauty that is a little bit sour than Manalagi. Their preference on local apple is different with them in Malang and Surabaya who prefer Manalagi. Their important motivation to consume apple are dietary and health primarily skin health.

Consumers in Yogyakarta perform a similar number of cultivars of Manalagi and Rome Beauty. We found that many consumers here have health motivation in consuming RB cultivar. Some of them even received doctor's suggestion to consume RB apple, since it has lower sugar and higher fiber.

On the imported apples, generally, consumers prefer Fuji cultivar, except those in Malang. Consumers in Malang prefer other cultivars, i.e. Red Delicious and Granny Smith. The last two cultivars of imported apple are grouped in others cultivar since the number of the consumer is less dominant. Fuji and Washington are the most favorite cultivar of imported apples.

Validity and Reliability Test

Most data on consumers are measured by using Likert scale. Therefore it needs validity and reliability tests. There are six quality attributes of apple measured with the Likert scale, namely: taste, aroma, juiciness, freshness, texture, and appearance.

Validity test was used to test the research instrument. The validity test uses Pearson correlation. It analyzes the correlation between each score of an attribute with the total score (Sanusi, 2015). The results of Pearson correlation are presented in Table 4. All items of the instrument are valid. It is indicated by the high Pearson correlation value. The significance level is mostly 1%. There is only one attribute with significance level 5%, i.e prestige motivation on local apple.

The reliability test uses Cronbach Alpha, its value on consumers of local and imported apple are 0.759 and 0763, respectively. It means that the data measurement is reliable. The reliability indicates that the research instrument is reliable to measure the tested construct (Field & Miles, 2010). Higher reliability

Table 4. Pearson Correlation For Validity Test on Apple Attributes

Description	Quality atributes of apple						
	Flavor	Aroma	Juiciness	Freshness	Texture	Appea-rance	Taste
Local apple							
Pearson Corr.	0,550**	0,577**	0,631**	0,600**	0,399**	0,786**	0,710**
Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000	0,000
N	120	120	120	120	120	120	120
Impored apple							
Pearson Corr.	0,464**	0,478**	,476**	0,300**	0,584**	0,620**	0,464**
Sig. (2-tailed)	0,000	0,000	,000	0,000	0,000	0,000	0,000
N	120	120	120	120	120	120	120

Table 5. Reliabilities of Local and Imported Apple Consumers

Local apples		Imported apples	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
0,759	14	0,763	14

Table 6. The Result of KMO and Barlett Test

		Apel lokal	Apel impor
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,740	0,691
Bartlett's Test of Sphericity	Approx. Chi-Square	560,075	347,590
	df	36	36
	Sig.	0,000	0,000

values are indicated by the alpha approaching one, it is generally agreed that reliability is considered satisfactory if alpha > 0.7 (Churchill, 1979).

The Result of Factor Analysis

Factor analysis was performed to determine the important attributes of apple quality. Some apple attributes that will be used in hedonic price analysis are firstly analyzed by factor analysis. The result of Kaiser-Meyer-Olkin (KMO) test showed homogeneity of the variables studied. The higher the value of KMO means the variables are more homogen.

The KMO values of factor analysis on local and imported apple are 0.740 and 0.691 respectively (Table 6). Those values indicate that the factor analyses have sufficient sample so that it can proceed. The range of KMO value is between 0 and 1, with a size limit on 0.5 (Kaiser, 1974 in Field & Miles (2010).

Table 7 explains the total variance of the three latent factors that is obtained from the orthogonal rotation (varimax method). Both local and imported apples, each gained three significant factors with the eigenvalue greater than one (Field & Miles, 2010). Percentage of variance shows the ability of a factor as an important factor. The higher percentage of variance shows the stronger ability. While the cumulative percentage of variance shows the ability of

Table 7. Total Variance Explained

Component	Initial Eigenvalues (local apple)			Initial Eigenvalues (imported apple)		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.967	36.066	36.066	3.470	31.544	31.544
2	2,231	20,281	56,348	1,967	17,885	49,429
3	1,273	11,573	67,921	1,307	11,884	61,312
4	0,908	8,254	76,175	0,993	9,024	70,336
5	0,659	5,990	82,165	0,781	7,101	77,437
6	0,505	4,589	86,754	0,624	5,674	83,111
7	0,439	3,994	90,748	0,587	5,333	88,444
8	0,335	3,042	93,790	0,408	3,706	92,150
9	0,315	2,864	96,654	0,360	3,274	95,425
10	0,302	2,747	99,401	0,258	2,347	97,771
11	0,066	0,599	100,000	0,245	2,229	100,000

the three factors found. Thus, the ability of the local apple factors to explain the quality attributes is 67.92%, while the same thing on imported apple is 61.31%.

Table 7 shows the loading factors after rotation. Loading factor on each factor is arranged sequentially from the largest to the lowest with a minimum limit of 0.5. Loading factor indicates the strength of the relationship between the attributes with the factors. The attributes in Factor 1 indicate the quality attributes of apple. Meanwhile, attributes of factor 2 show cultivars and size of apples. Lastly, factor 3 indicates purchasing place of apples. For the purpose of seeking hedonic price, especially, all attributes are raised in the analysis, not merged into a single factor. However, in this paper, there is a discussion of the factors that contain a group of attributes.

The result of factor analysis suggests that there is a little difference in composition between the attributes of local and imported apple. On local apples, first latent factor includes all quality attributes of apple, second latent factor includes attributes of cultivars and size, and the third latent factor includes the purchasing place and attribute of texture. On imported apple, the first latent factor also includes quality attribute, second latent factor includes cultivar and size, while the third latent factor includes the only purchasing place. However, the overall results indicate that the attributes tested are recommended to be analyzed further on hedonic price model. In particular, this paper discusses more detail about the results of the factor analysis. The first latent factor on local apple is closely related positively to the quality attribute of apple, namely juiciness, appearance, freshness, aroma, and taste. Among the five quality attributes, juiciness has the greatest loading factor, which means that this attribute has the strongest correlation with the latent factors. Nevertheless, the loading factors on all attributes of factor one are only a little bit differ, and all of them are positive.

If we compare the first latent factors on local and imported apple, there are following differences. Based on loading factors, the order of attribute on local apples juiciness, appearance, freshness, aroma and flavor; whereas on imported apples are appearance, texture, aroma, juiciness and freshness. Thus, the most important attribute of local apples is juiciness. Meanwhile, the most important attribute of imported apple is appearance. Meanwhile, the last attribute of local apple is flavor, whereas the last order on imported apples is freshness.

If we compare the second latent factor between local and imported apples, there are some similarities. Firstly, based on loading factor, the attributes order on local apple are RB, Manalagi and size; whereas on the imported one are Fuji, Washington, sizes and flavor. There is a similarity between local and imported apples in terms of cultivar and size. However, flavor attribute on imported apples entered in the last sequence of the second latent factor. Second, there is a similarity on negative loading factor, i.e. on the cultivar of Rome Beauty and Washington. This means that the correlation between those cultivars with the second latent factor is strong enough but has the opposite relationship.

The last, the third latent factor is compared. The order of attributes based on loading factor on local apple is a fruit stall, supermarket and texture attribute, whereas the order on imported apples are fruit stall and then the supermarket. Loading factors on the fruit stall are negative, both on local and imported apples. It means that the correlation between fruit stall with the third latent factor is strong enough but it has the opposite relationship.

Discussion

The results show that the important factors in the purchasing apples are the attributes of quality, cultivar and purchasing place. There are some similarities between local and imported apples. These results generally support previous studies published in some journals that the quality attributes of apple affect consumer preferences {Manalo (1990); Péneau, *et al* (2006); Harker, *et al* (2008), and Widyadana, *et al* (2013). Furthermore, apple cultivars also affect consumer preferences, in accordance with previous studies {Péneau, *et al* (2006); Carew, (2000) dan Skreli & Imami, 2012b)}. Likewise, a significant purchasing place supports the previous study that the discount store or supercenter influence the price of tomato (Huang & Lin, 2007).

All attributes of quality factor on both local and imported apples have positive loading factor. This means that all attributes are correlated with the same direction with the latent factors of apple quality. In more detail, local apple quality is getting better if the attributes are increasingly juicy, smooth, fresh, smell nice and sweet.

Table 8. Rotated Component Matrix of Local and Imported Apple

Local Apple				Imported Apple			
Attribute	Loading factors on each component			Attribute	Loading factors on each component		
	1	2	3		1	2	3
Juiciness	0,808	0,136	0,089	Appearance	0,813	0,237	-0,039
Appearance	0,788	0,095	0,185	Texture	0,768	0,025	0,238
Freshness	0,785	0,174	0,051	Aroma	0,677	0,100	0,300
Aroma	0,704	-0,009	0,275	Juiciness	0,654	0,067	0,167
Flavor	0,691	-0,364	0,125	Freshness	0,532	-0,029	-0,327
Rome B	0,086	0,958	-0,039	Fuji	-0,100	0,857	-0,262
Manalagi	0,019	-0,956	0,052	Washington	-0,195	-0,817	0,094
Size	0,440	0,477	0,364	Size	0,022	0,647	0,294
Fruitstall	0,089	0,104	-0,822	Flavor	0,378	0,618	0,273
Supermarket	0,375	-0,037	0,788	Fruitstall	-0,030	0,027	-0,846
Texture	0,306	0,103	0,570	Supermarket	0,398	0,068	0,677

Note: Loading Factors In Bold Shows Higher Correlation With the Rotated Component

While imported apple quality is better if the quality attributes are increasingly smooth, crisp, smell nice, juicy and fresh. The results of this study support previous studies about the quality of apples {Manalo (1990); Péneau, *et al* (2006); Harker, *et al* (2008) and Widyadana, *et al* (2013)}.

The different findings of this study are on apple's juiciness of local apple and appearance of the imported apple. They are significant and rank on the first order of the first factor. Juiciness attribute has not been found in the abovementioned studies (Table 1). Meanwhile, the attribute of appearance in the previous studies was measured from the consumer's preference when they are choosing an apple {Péneau, *et al* (2006); Widyadana, *et al* (2013); and Moor *et al.* (2014)}. In addition, consumers assess imported apple better than the local one, where the biggest gap happens on the attributes of juiciness and appearance (Table 9). This fact supports the explanation of this analysis result.

This study measures the attribute of appearance from the consumer's assessment to the apples have just been bought. Moreover, the previous study only used cultivar in the description of consumers' number and the percentage who buy certain cultivars (Widyadana *et al*, 2013). This finding also different with the previous study, in which consumers' perception on the freshness of apple was asked before they purchase apple (Péneau *et al*, 2006). Meanwhile, this study asked consumers' assessment on freshness after purchasing apple. All attributes of apple quality in this study are measured from the existing condition. Thus, this study has a contribution in giving information about the existing quality attributes base on consumers' assessment.

Based on loading factor, the flavor of local apple ranks in the last, even the flavor attribute on imported apples placed on the second latent factors (cultivar and taste) with the lowest loading factor. This finding is not in line with the previous studies that flavor is ranked the highest of ten attributes of apple quality (Jones, 1996). This result is also somewhat different from Widyadana *et al* (2013) who obtained three top attributes of size, color, and flavor with almost the same consumer ratings. This research found that flavor attribute is important in determining quality attributes. However, it is not in the first order of the consumers' preference. A further analysis is needed to proof this finding, namely to analyze the influence on the apple price and consumers demand on apple.

In the factor of cultivar, there are attributes with negative loading factor, i.e. Manalagi cultivar on local apple and Washington cultivar on imported apple. It means that those cultivars have a negative correlation with the latent factors. The cultivar attribute is a dummy variable, namely the cultivars purchased when the survey was conducted. The negative loading shows a negative correlation between the cultivars with the latent factor.

Size is grouped on the factor of cultivars factors, both at local and imported apples. This means that size of apple closely correlated with factors of cultivars. The explanation can be given is that on local apple, the cultivar of Rome Beauty has larger average size than Manalagi and Anna. The field data shows the average weight (ounce per fruit) of Manalagi, RB and Anna are 1.38, 1.56 and 1.14, respectively. While on imported apples, Fuji cultivar also has larger average size than Washington cultivar. Field data shows the average weight (ounce per fruit) of Fuji, Washington and others are 2.05, 1.67, and 1.75 respectively.

Using size of apples with the average weight per fruit differs from previous studies that used diameter [Manalo (1990); (Jones, 1996)); Carew, (2000); Péneau, *et al* (2006); Harker, *et al* (2008); and Skreli & Imami (2012)]. Measuring apple by using weight per item is technically easier to do. It is done by dividing the weight of apples purchased by the number of apples. Local apple traders also perform grading by counting the number of apple fruit per Kg, it is ranging from 5-6 fruits, 7-8 fruits, 9-10 fruits, 11-12 fruits, and so on. Using weight in measuring apple in this research is closer to the practical way done by the trader in Malang Raya who grade apple by using the number of fruit per kilogram. Thus, this research gives a contribution in measuring technique that more adapted in Indonesian situation.

On imported apples, there are different results with the local one, namely attribute of flavor is grouped on the factor of cultivar. On average, consumers give

a greater score to Fuji and other cultivars compared with Washington. Thus flavor attribute is closely attached with the attribute of cultivar so that they presence in the same factor.

The factor of purchasing place has similarities between local and imported apples, namely fruit stall has negative loading factor. It means that fruit stall has a negative correlation with the factor of purchasing place. Generally, the fruit stalls sell local and imported apples with the quality attributes assessed lower than supermarkets but higher than traditional markets (Figure 3 and 4). Since the comparison is dummy variable of the supermarket, so that fruit stall has a lower score, thus fruit stall has a negative correlation with the factor of purchasing place.

Texture attributes of local apple are grouped in the factor of purchasing place, with a positive sign. It is hard to explain the relation of texture and purchasing place. However, the data shows that in general, consumers assess apples sold in a supermarket with a higher score than those in fruit stall and traditional market (Figure 3). Thus, the presence of texture is closely associated with purchasing place, so that they are located at the same latent factor.

Consumers in supermarket give the highest score for all quality attributes on local apple (Figure 3). The lower scores are given by consumers in fruit stall and traditional market, respectively. There are four attributes that have average score more than four, i.e. flavor, aroma, freshness, and appearance. The four attributes on supermarket have a contrast score with fruit stall and traditional market. This means that supermarkets sell the highest grade and quality of local apples, indeed with the highest price.

On the imported apple, supermarkets' consumers also give the highest score of the apple attributes (Figure 4). However, the lowest score does not always happen on the traditional market. Consumers of traditional market give a higher score on the attributes of flavor, texture, and size, compared with them in fruit stalls. This means that the imported apples sold in fruit stalls and traditional markets have the relative same quality.

The average consumers' assessment on local and imported apples is mentioned in Table 9. Almost all attributes of imported apple are assessed better than the local one. The two biggest score margins occur in juiciness (0.55) and appearance (0.41). It means that according to consumers, those attributes of local apples are much lower than the imported apple. The margin of size can not be compared to the others attributes measured with the Likert scale since size is measured with apple's weight in the ounce. The average size margin between local and imported apple is 0.44 ounce per fruit. This is also a contrast quality attribute.

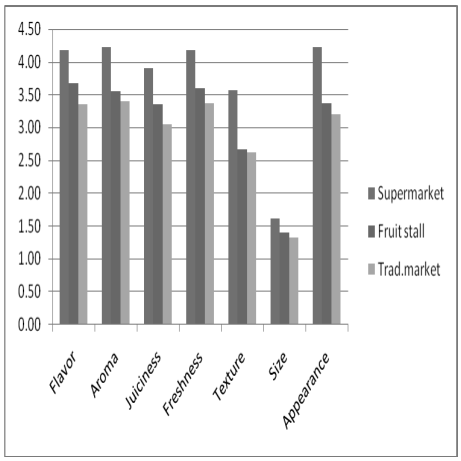

Figure 3. The Average Score of Consumers' Assessment of The Attributes of Local Apples at Three Categories of Purchasing Place

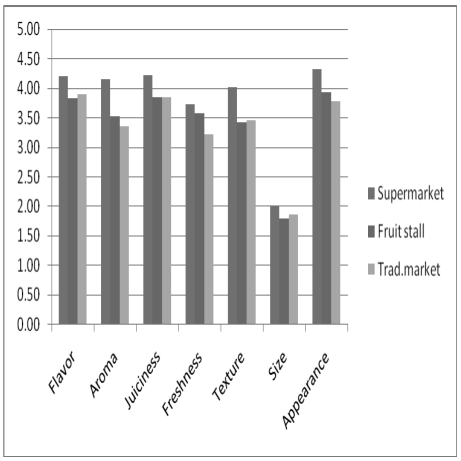

Figure 4. The Average Score of Consumers's Assessment of The Attributes of Imported Apples at Three Categories of Purchasing Place

Table 9. Consumers' Assessment on The Apple's Attribbutes

Apple Origin	Flavor	Aroma	Juiciness	Freshness	Texture	Size*	Appearance
Local	3,73	3,73	3,43	3,72	2,96	1,45	3,60
Imported	3,98	3,68	3,98	3,51	3,63	1,89	4,01

Note: All attributes are shown in the avarage skore of Likert scale, except size* that is measured with average weight of apple (sounce).

There are only two attributes of local apple that are assessed better than the imported one, i.e. aroma and freshness. This means that local apples have advantages in term of aroma and freshness, comparing with the imported one.

CONCLUSION AND SUGGESTION

The important quality attributes of local and imported apples are grouped in each two latent factors are quality and cultivar and purchasing place. All quality attributes have a positive correlation with the apple quality, but there is a different finding. Flavor is not the most important attribute that ranked first based on consumers' assessment.

The factor of apple cultivar always associates with the apple size, both on local and imported apples. Rome Beauty on local apple and Fuji on imported apple have greater average size than other cultivars, so these attributes are already attached one each other.

The factor of purchasing place becomes an important part which accompanies the apple's quality attributes and is considered by consumers in purchasing apples. The importance of this factor is related to the selection of apple quality by retailers, as well as comfort and service given, will also influence consumer assessment on the quality attributes of apple.

Our study finding supports the previous studies about apple's attributes conducted elsewhere {Manalo (1990); Péneau, *et al* (2006); Harker, *et al* (2008), Skreli & Imami (2012) and Widyadana, *et al* (2013)}. On the other hand, our study adds new knowledge on consumer preference, i.e. in categorizing apple quality base on quality attributed, cultivar, and purchasing place. This study provides detailed information about consumers' assessment of the existing apple quality attributes, which is useful to the apple agribusiness stakeholders.

Some recommendations are given as the follow-up of the study results are as follows. 1) local apple farmers are suggested to pay attention to the apple cultivation that produces qualified apples with such attributes; juiciness, appearance, freshness, aroma and flavor are important attributes associated with the cultivation of local apples. 2) Apple traders are also suggested to participate in maintaining the apple quality attributes, which are related with freshness; post-harvest handling, packaging, and transportation. 3)Apple retailers also participate in maintaining the appearance and freshness of apples on the display; meanwhile traditional market that does not use cooling display, how to manage apple freshness is by rapid product circulation, meaning that the stock number in one time period may not exceed the amount of apple could be sold. 4) It is recommended to do further analysis on hedonic price model of the local and imported apples.

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