Proceeding

6th INTERNATIONAL SEMINAR ON INDUSTRIAL ENGINEERING AND MANAGEMENT (6th ISIEM)

"Sustainable innovation on enhancing industrial management, technology, and information"

ISIEM

Harris Hotel Batam Center, Batam, Indonesia
February 12th - 14th, 2013

Organized by:

PASUNDAN UNIVERSITY

UAI
Universitas Al Azhar Indonesia

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Proceeding

The 6th International Seminar
on Industrial Engineering and Management (6h ISIEM)

Harris Hotel Batam Center, Batam, Indonesia
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Organized by :

Industrial Engineering Department of

Supported by :

Indonesian Industrial Engineering
Higher Education Association

FOREWORD

In this 6th International Seminar on Industrial Engineering and Management (ISIEM) Seminar issues is **Sustainable on Enhancing Industrial Management, Technology, and Information**, and wide area of Industrial Engineering including Quality Engineering, Supply Chain Management, Production System, Operation Research, Decision Support System, Ergonomics, Artificial Intelligent, Industrial Management, and Entrepreneurship.

All of papers received were review by a peer of reviewers and published for 55 papers from various Indonesian University and abroad, and be presented by 52 presenters.

Historical, the ISIEM is an annual seminar event organized by 6 universities that run Industrial Engineering Department, which are Triskati University Jakarta, Atmajaya Catholic University Jakarta, Tarumanagara University Jakarta, Esa Unggul University Jakarta, Al-Azhar Indonesia University Jakarta, and Pasundan University Bandung. The seminar took different places annually in all over Indonesia.

I would like to thank you to all committees for the efforts, all Reviewers, Mr. Predeep Nair from Schneider Manufacture Batam, Prof. Dr. Rosnah Mohd. Yusuff from Department of Mechanical and Manufacturing Engineering Universiti Putra Malaysia, Prof. Frits Blessing from Rotterdam University/Rotterdam Business School, for the Keynote Speeches, all Participants to join the Seminar, and everybody who helped us to make this seminar happen.

At last, enjoy your stay in Batam and have a good Seminar.

Ir. Wahyukaton, MT.
(Pasundan University Bandung)

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A G E N D A

Day 1 (February 12th, 2013)

Opening ceremony
Gala Dinner
Keynote #1

Mr. Pradeep Nair
Plant General Manager PT Schneider Electric Manufacturing Batam

Day 2 (February 13th, 2013)

Keynote #2

Prof Rosnah Mohd Yusuff
Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia
"Innovations In Manufacturing For Sustainable Growth"

Coffee Break
Parallel Session #1
Lunch
Keynote #3

Prof. Frits Blessing
DINALOG & Rotterdam University of Applied Sciences
"I Have To Change To Stay The Same"

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SCM – Supply Chain Management

SCM – Supply Chain Management

OR – Operation Research

ER – Ergonomics

ER – Ergonomics

DSS – Decision Support System and Artificial Intelligence

PS – Production System

PS – Production System

IM – Industrial Management

CONSUMER PREFERENCES AND QUALITY PERCEPTION OF IMPORTED AND DOMESTIC APPLE IN SURABAYA

I Gede Agus Widyadana[1], Tanti Octavia[2], Herry Christian Palit[3], Dick Felix Wibowo[4]

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ABSTRACT

Domestic fruits are one of Indonesian's top commodities, but unfortunately they are threatened by imported fruits, including apple. This research aims to know the consumers' preference and perception of imported and domestic apple. The location of this research is Surabaya where 200 housewives are chosen as sample. Data points out 85% respondent prefer imported apple compare to domestic apple. The result of this research shows there are different from quality perceptions in size, color, appearance, aroma, cleanness, crispness, taste, and hygiene between consumers who prefer imported and domestic apple. However, juiciness has the same quality perception between both of them. Finally, factor analysis indicates there are three groups of quality perception based on high-income consumers who prefer to purchase domestic fruits.

Key words: *quality perception, consumer preferences, apple*

1. INTRODUCTION

The domestic fruits are a large sector within Indonesia markets. The Ministry of agriculture stated 56 percent of domestic fruits are distributed in modern markets (supermarkets, hypermarkets, fruits stores).

In fact, imported fruits dominate in modern markets and traditional markets. For 2009-2010, the imported fruits are increasing (Badan Pusat Statistik, 2011). Among the overseas of Indonesia imported fruits, China is the largest fruits exporting to Indonesia and accounts for US\$ 331 million in 2011. Some of the imported fruits, such as: orange and banana were increasing 10,956 tons and 710 tons, respectively. On the other hand, the domestic fruits for orange and banana were decreasing 103,674 tons and 618,460 tons, respectively.

In Indonesia, fruits are sold in traditional market and modern markets. In modern markets, they sell more the imported fruits compare to the domestic fruits. And nowadays, in traditional markets, many domestic seasonal fruits are placed on stands and some of imported fruits are also sold. Usually, the imported fruits have a good appearance and the consumers have

the perception that appearance is related to good quality. In contrast, Hardiyanto (2010) observed that the freshness of the imported orange was less than the domestic orange. It occurs since the imported orange has been preserved in cold storage for six months until one year. Moreover, Kienzle et al, (2011) conduct a research about the harvest maturity specification for mango fruit in regard to long supply chains. The harvest maturity is necessary to reduce the risk during transportation. Reichel et al, (2010) also conduct a research about the influence of harvest maturity on quality and shelf-life of litchi fruit

In term of consumers' preference, many researches have been done. Sun and Collins (2004) acquires a comparison the purchasers' attitude between two different cities in China. They stated that the purchasers' attitude toward imported fruit was influenced by the city background and education level. Furthermore, Brown et al, (2009) found the difference of consumers' preference in England and France for organic fruit and vegetable which was delivered to consumers directly or distribution point near consumers' location. It is obtained that consumers in England prefer to buy product regarding to the shortness of

its distribution, while consumers in France regarding to the product quality. Webber et.al, (2010) conduct a research about fruit purchased by low-income households in America. It is concluded that the consumers give attention to the location of grocery store, atmosphere of grocery store, product quality, product price and the relationship with the seller.

Related to consumers' perception, Garitta et al, (2008) points out the optimum time for tomato harvesting to get the product that is desired by consumers. When the consumers choose fruits, the consumers often discover the fruits that is harvested too early so that the fruits have less quality or harvested too late. Peneau et al, (2006) acquired that taste, aroma and freshness are the most frequently used by consumers to choose apple. They also conclude that in the consumers' perception, freshness can be seen from the taste, crispness and juiciness of the fruit.

This paper attempts to address the preference and quality perception in purchasing the domestic apple and the imported apple. An outline of this paper is organized as follows. In section 2, research methodology is provided. Result and discussion is described in section 3. Section 4 gives the conclusion of this paper.

2. RESEARCH METHOD

This research is started by surveying the traditional markets. The interview with the sellers in some traditional markets is carried out to gather the information regarding the customers' perceptions and preferences. In this survey, closed ended questionnaire was distributed to 200 housewives at some traditional markets and supermarkets in four areas of Surabaya (Western-Surabaya, Eastern-Surabaya, Southern-Surabaya, Northern-Surabaya). Housewives are chosen since they usually buy the daily meals. The total samples are proportional with total population of four areas of Surabaya. Thus, the number of respondents from North Surabaya, East Surabaya, West Surabaya, and South Surabaya was 66, 52, 29, and 53, respectively. The questions are

constructed related to demographic of respondents, respondents' preferences for domestic and imported fruits and their reasons, their quality perceptions in purchasing domestic and imported fruits. Before distributing the large number of sample questionnaire, the small sample of respondents is distributed in order to ensure the questionnaire can be comprehended.

The consumers' preferences are analyzed using descriptive statistic, while quality perception of customers is analyzed using Kruskal-Wallis test. The quality perception is analyzed based on two factors: fruits purchasing and economic level. Fruits purchasing factor consists of domestic fruits, imported fruits, and both of them. Economic level consists of low to middle income and high income. This test is applied to know the difference of quality perception based on those factors. Scoring system is conducted by using Sixth Likert type scale, from score 1 is very unimportant to score 6 is very important.

Furthermore, factor analysis is utilized to identify the influence of economic level and the type of fruits purchasing according to consumers' quality perception of apple. Based on factor analysis, the consumers' quality perception of apple also could be grouped in less number.

3. RESULT AND DISCUSSION

All of 200 questionnaires are valid and reliable to analyze. Based on these questionnaires, it is figured out that the majority of respondents are more than 40 years old (58.5%) with the level of income between 2.5 and 7.5 million rupiahs (45%). 75.4% of the major respondents is preferred to buy the imported fruits.
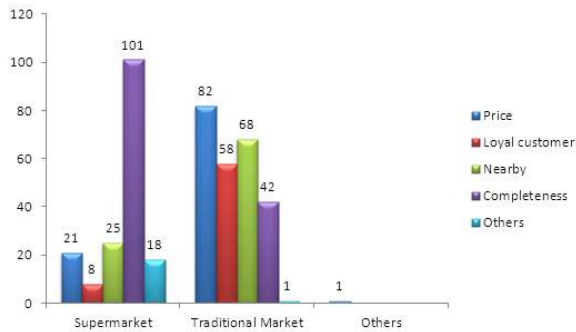
Figure 1. Reason For Choosing Location Of Purchasing

Figure 1 shows that most of respondents prefer to purchase fruits at the supermarket (52%) because of its completeness. On the other hand, the main reason of the respondents who purchase fruits at traditional market is its price.
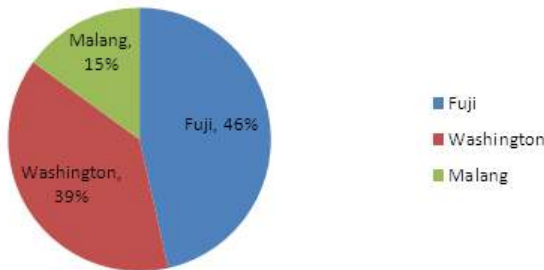
Figure 2. Type of Apple Purchasing

Figure 2 shows that consumers prefer to purchase the imported apple (Fuji and Washington apple) as 85%. The perceptions of consumers about the characteristic of a good apple are shown in Figure 3. The best of three of quality attributes of apple that are perceived by consumers are the color, appearance, and taste.
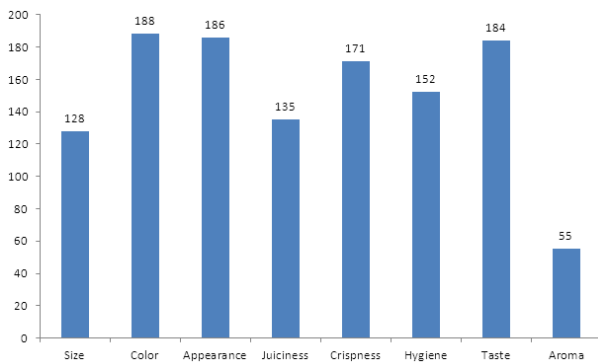
Figure 3. Characteristic of Good Apple from Consumers' Perception

Kruskal-Wallis test is obtained to know the difference of quality perception of apple according to type of fruits purchasing and economic level. As presented in Table 1, *P-value* of all attribute qualities is smaller than 0.05, except juiciness. It means that consumers have the difference perception of quality attributes of apple, except juiciness according to type of fruits purchasing.

Besides, all mean rank of imported fruits is higher than local fruits and both of them (Table 2). This data show consumers who purchase imported fruits are more concern with the quality attributes compare to the local one and both of them. The same analysis could be made according to economic level which is divided to two levels, low to middle income and high income.

As shown in Table 3, *P-value* of all attribute qualities are smaller than 0.05. It means consumers have difference perception of quality attributes of apple toward to economic level. Also, all mean rank of high income is higher than low to middle income (Table 4). This data show that high income consumers are more concern about the quality attributes than low to middle income.

In order to further analyze the influence of economic level and the type of fruits purchasing on the consumers' quality perception of apple, factor analysis was carried out. In Table 5 could be seen that consumers in low to middle income who purchase domestic fruits, consider all quality attributes. Thus, in this section, there is no group of quality perception. However, consumers in high income are grouped into three groups of quality perception. The first group considers size, color, appearance, crispness, and juiciness. The second one considers hygiene and aroma. Finally, the third one only considers taste.

Consumers in low to middle income and high income who purchase imported fruits and both have similar choices perception of quality attributes. There are 2 groups of perception for each type of fruit purchasing.

4. CONCLUSION

The result of this research shows the major respondents are preferred to purchase the imported fruits as 75.4%. Most of respondents also prefer to purchase fruits at the modern market (52%) because of its completeness. 85% of respondents prefer to buy imported apple compare to domestic.

In general, there is a difference of perception for each quality attributes based on the type of fruits purchasing and economic level. Consumers who choose imported fruits pay more attention to all quality attributes compare to consumers who choose either domestic or both, in term of type of purchasing. In term of high income, consumers consider more on all quality attributes in purchasing fruits compare to consumer in low to middle income. This research also shows that there is an influence of economic level and type of fruit purchasing to quality perception. There are two groups of economic level who have different quality perception of apple based on the type of fruit purchasing.

5. REFERENCES

(a) Brown E., Duty S., Holdworth M., (2009). "Motivations of consumers that use local, organic fruit and vegetable box schemes in Central England and Southern France", Appetie, 53(2), 183-188.
(b) Central Bureau of Statistics of Indonesia (2009-2010).Indonesia. Retrieved from: http://www.bps.go.id/exim-frame.php. Access date: 21 December 2011
(c) Garitta L., Hough G., Hulshof E., (2008). "Determining optimum ripening time of fruits by applying survival analysis statistics to consumer data". Food Quality and Preference, 19 (8), 747-752.
(d) Hadiyanto, (2010). "Mampukah jeruk keprok nasional kita menggeser jeruk impor?" Retrieved from: http://balitjestro.litbang.deptan.go.id/id/374.html. Access date: 21 December 2011
(e) Kienzle S., Sruamsiri P., Carle R., Sirisakulwat S., Spreer W., Neidhart S., (2011). "harvest maturity specification for mango fruit (Manifera Indica L. 'Chok Anan') in regard to long supply chains", Postharvest Biology and Technology, 61(1), 41-55.
(f) Reichle M., Carle R., Sruamsiri P., Neidhart S., (2010). "Influence of harvest maturity on quality and shelf-life of litchi fruit (Litchi chinensis Sonn)", Postharvest Biology and Technology, 57(3), 162-175.
(g) Peneau S., Hoehn E., Roth H-R., Escher F., Nuessli J., (2006). "Importance and consumer perception of freshness of apples". Food and Quality Preference, 17(1-2). 9-19.
(h) Sun, X., and Collins R., (2004). "A comparison of attitudes among purchasers of imported fruit in Guangzhou and Rumqi, China", Food Quality and Preference, 15(3), 229-237.
(i) Webber C.B., Sobal J., Dollahite J.S., (2010). "Shopping for fruits and vegetables. food and reatail qualities of importance to low-income households at the grocery store". Appetite, 54(2), 297-303.

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Table 1. *Quality Perception According To Type of Fruits Purchasing*

	Size	Color	Appearance	Hygiene	Crispness	Taste	Aroma	Juiciness
Chi-Square	14,214	20,194	22,291	22,954	6,579	7,183	13,26	1,909
Df	2	2	2	2	2	2	2	2
Sig.	,001	,000	,000	,000	,037	,028	,001	,385

Table 3. *Quality Perception According To Economic Level*

	Size	Color	Appearance	Hygiene	Crispness	Taste	Aroma	Juiciness
Chi-Square	18,480	27,408	26,420	28,666	41,074	7,017	20,578	9,791
Df	1	1	1	1	1	1	1	1
Sig.	,000	,000	,000	,000	,000	,008	,000	,002

Table 2. *Mean Rank of Quality Perception According To Type Of Purchasing*

Attribute Purchasing	Type of Purchasing	N	Mean Rank
Size	Domestic	30	101,20
	Import	92	115,15
	Both	78	82,96
	Total	200	
Color	Domestic	30	102,08
	Import	92	116,54
	Both	78	80,97
	Total	200	
Appearance	Domestic	30	96,77
	Import	92	118,10
	Both	78	81,18
	Total	200	
Hygiene	Domestic	30	111,15
	Import	92	116,88
	Both	78	77,09
	Total	200	
Crispness	Domestic	30	88,95
	Import	92	110,72
	Both	78	92,88
	Total	200	
Taste	Domestic	30	106,32
	Import	92	108,99
	Both	78	88,25
	Total	200	
Aroma	Domestic	30	104,33
	Import	92	114,00
	Both	78	83,10
	Total	200	
Juiciness	Domestic	30	98,47
	Import	92	106,24
	Both	78	94,51
	Total	200	

Table 4. Mean Rank of Quality Perception According To Economic Level

Attribute	Economic Level	N	Mean Rank
Size	Low to middle income	121	86,87
	High income	79	121,37
	Total	200	
Color	Low to middle income	121	85,11
	High income	79	124,08
	Total	200	
Appearance	Low to middle income	121	85,52
	High income	79	123,45
	Total	200	
Hygiene	Low to middle income	121	83,51
	High income	79	126,53
	Total	200	
Crispness	Low to middle income	121	81,27
	High income	79	
	Total	200	129,95
Taste	Low to middle income	121	92,64
	High income	79	
	Total	200	112,53
Aroma	Low to middle income	121	86,12
	High income	79	
	Total	200	122,53
Aroma	Low to middle income	121	90,51
	High income	79	
	Total	200	115,80

Table 5. *The Result of Factor Analysis*

Type of fruits purchasing	Economic Level	
	Low to middle income	High income
Domestic	Size, Color, Appearance, Hygiene, Aroma, Taste, *Crispness*, *Juiciness*	F1: Size, Color, Appearance, *Crispness*, *Juiciness* F2: Hygiene, Aroma F3: Taste
Import	F1: Size, Hygiene, Aroma, *Juiciness* F2: Color, Taste, *Crispness*	F1: Size, Hygiene, *Crispness*, Aroma, *Juiciness* F2: Appearance, Color, Taste
Both	F1: Size, Hygiene, Aroma, *Crispness, Juiciness* F2: Appearance, Color, Taste	F1: Size, Hygiene, *Crispness, Juiciness* F2: Appearance, Color, Taste