

# Integration of Customer Requirement and Technical Characteristics of Packaged Palm Cooking Oil Policy in Indonesia by Fuzzy MCDM in QFD and ME-MCDM

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## Abstract

Policy of conversion from bulky to packaged palm cooking oil is defined by three subsystems are production, distribution and monitoring. The purpose of production subsystem is to find aggregation of consumer requirement and technical characteristics by MCDM, QFD and ME-MCDM method. Bulk palm cooking oil considers converting to packaging because unhygienic factor, untraceable factor, metrology legal factor, and unhealthy factor. This research defines that variable of price with value 0,12, color of palm cooking oil with value 0,12 and packaging size with value 0,10 are dominants of consumer required. Subsidies of tax, packaging machine donor, and packaging factory mechanism are significant to reduce the price of packaged palm cooking oil. Red palm cooking oil was recommended to keep pro-vitamins A or beta-carotene and other natural micronutrient. MINYAKITA was brand launched by Ministry of Trade to help production factory and packaging factory who's made packaging palm cooking oil. Varian's sizes of packaged cooking oil are need by middle and low income customer. SNI 7709 year 2012 was defined that palm cooking oil must pontificated by vitamin A should change to contain Vitamin A, so beta-carotene and natural micronutrient can be maintained.

**Keywords:** palm cooking oil, fuzzy multi criteria decision making (fuzzy-MCDM), quality function deployment (QFD), multi expert multi criteria decision making (ME-MCDM)

## 1. Introduction

Palm cooking oil is one of the basic needs in accordance with Presidential Decree No. 71 of 2015 regarding the Determination and Storage Basic Foodstuffs and Essential Goods. The palm cooking oil national consumption of households currently reaches 5.2 million tons per year with 64.3% of the total palm oil industry products in the bulk cooking oil or non-branded, while 12.4% of packaging palm cooking oil, 15% palm olein for industry, and 8.3% is a specialty margarine and fat. Cooking oil consumption by society in Indonesia is quite high. One factor is they likely to be preferred fried food than boiled, because it more savory taste and crunchy (Aminah, 2010), in addition to the storage life of the food more longer (Supriyatna, 2006). Thus in some communities in Indonesia, cooking oil is very difficult to separate from public life (Hartini, 2011). Over time, especially among people in a weak economy, consumption of edible oil in the world is likely to increase (Sumaryanto, 1996). Price difference between branded and bulk cooking oil was the main reason why more bulk palm cooking oil have to be consumed (Martianto, 2005). In the world today, only in Indonesia and Bangladesh are predominantly still consume the bulk palm cooking oil, resulting in Southeast Asia only Indonesia are still using cooking oil for domestic consumption.

Conditions bulk palm cooking oil was stored in silos or drum that has been mixed from various manufacturers which serve in an open condition. This causes not hygiene also it would prone to mixing with other for example mixed with used cooking oil. Therefore if there is a health risk for consumers would be difficult to discover who is responsible, so that consumer rights are not protected, in contravention of the Consumer Protection Act No. 8 of 1999. Guarantees accuracy of the measurement, measure and weigh it also can be an obstacle, because bulk palm cooking oil was packed by traders whose do not use standard measuring tool, so it is not in accordance with Law No. 2 of 1981 on Legal Metrology. In addition, these conditions also

hamper the halal certification process, due to problems untraceable of bulk cooking oil producers.

The palm cooking oil for public consumption is cooking oil that is in accordance with the Indonesian National Standard (SNI) No. 7709 of 2012 on palm oil and has been qualified testing the quality of cooking oil in accordance with the Indonesian National Standard No. 01-3741 2013. Implementation of SNI No. 7709 of 2012 on the national quality standard of packaging palm cooking oil is a preparatory step the government implements packaged cooking oil consumption for the Indonesian people. Implementation of SNI number 7709 of 2012 set a mandatory basis by the issuance of the Minister of Industry Decree No. 87/M-IND/12/2013, which further enforcement was extended until 2018 by the Minister of Industry Decree No. 100/ M-IND/PER/11/2015. The Ministry of Trade also initiated measures to make packed palm cooking oil through the Minister of Trade decree Number: 02/M-DAG/PER/1/2009 on palm cooking oil simple packaging. Furthermore, to support the program issued by Trade Minister Regulation No. 80/M-DAG/PER/10/2014 on compulsory packaging cooking oil, which was amended by Regulation No. 21/M-DAG/PER/3/2015. This regulation will be enforced on March 1, 2017. It thus provides opportunities to producers or packers companies both at central and local levels to do the packaging on palm cooking oil. To achieve this aim, hence the need for a model system conversion policy bulk cooking oil to the packaging, in which is described the mechanism of production subsystems.

Subsystems production mechanisms implemented on the basis of cooperation between the government through the Ministry of Trade and the Ministry of Industry with the national oil producers. Governments have a role in the preparation of regulations and stimulating their implementation. The purpose of the production mechanism is to get the products according to the needs and desires of consumers to be translated in product design and the design of the production process in the mechanism of the voice of the consumer which is integrated in the Quality Function Deployment (QFD) (Liu, 2009, Sulistyono, 2011).

QFD is a method commonly used in product development (Bottani, 2006). production Mechanism based on QFD then integrated with Multi Criteria Decision Making (MCDM). Integration that methods are expected to accommodate all the conditions and desires of stakeholders. It also can make the operating results of QFD be closer to the real conditions compared to conventional QFD(Liu, 2009).

## 2. Method

### 2.1 Research Framework

The approach in this model is a systems approach. Basically, the systems approach is the application of scientific management system (Marimin, 2009). Systems thinking is applied for alignment turf through a full understanding (Eriyatno, 1996). The system is a single entity, made up of parts that are interrelated on a regular basis and to achieve goals in complex environments (Marimin, 2009). Production mechanism explains how oil is produced and supplied to consumers in accordance with the wishes and needs of consumers.

Production mechanisms system consider the specifications of consumers in the determination of the type of product and process design with Multi Criteria Decision Making (MCDM) non-numerical methods. Further integration between consumers' desire/Consumers requirement (Cr) and a process or product design/Design requirement (Dr) are construct with Quality Function Deployment (QFD). QFD is a unique system for developing new products that aim to make sure that the quality of the product in accordance with the wishes and expectations of consumers, hereinafter represented in the House of Quality (HOQ) as a place to transform the consumer wants and needs into product characteristics (Bottani, 2006). In the development of QFD too many combined with other techniques to get the effectiveness, efficiency and optimization for example MCDM. In determining the design requirements or technical characteristics (TC), which is owned by the manufacturer are often encountered some expert review. Therefore methods Expert Multi-Multi-Criteria Decision Making (ME-MCDM) is used for aggregating the expert opinion. Thus obtained the conclusion of the aggregation of expert judgment.

In the actual facts fuzzy values in the judging process are often encountered. The blurring of the value of giving situation is very close to reality and perception of assessors. Therefore, the addition of fuzzy important in solving the problem that has a value that is not the discrete. The language issue is vague and fuzzy variables qualitatively in QFD process can be used to improve the performance of logistics, customer satisfaction and build market share. Flowchart production mechanism system can be seen in Figure 1.

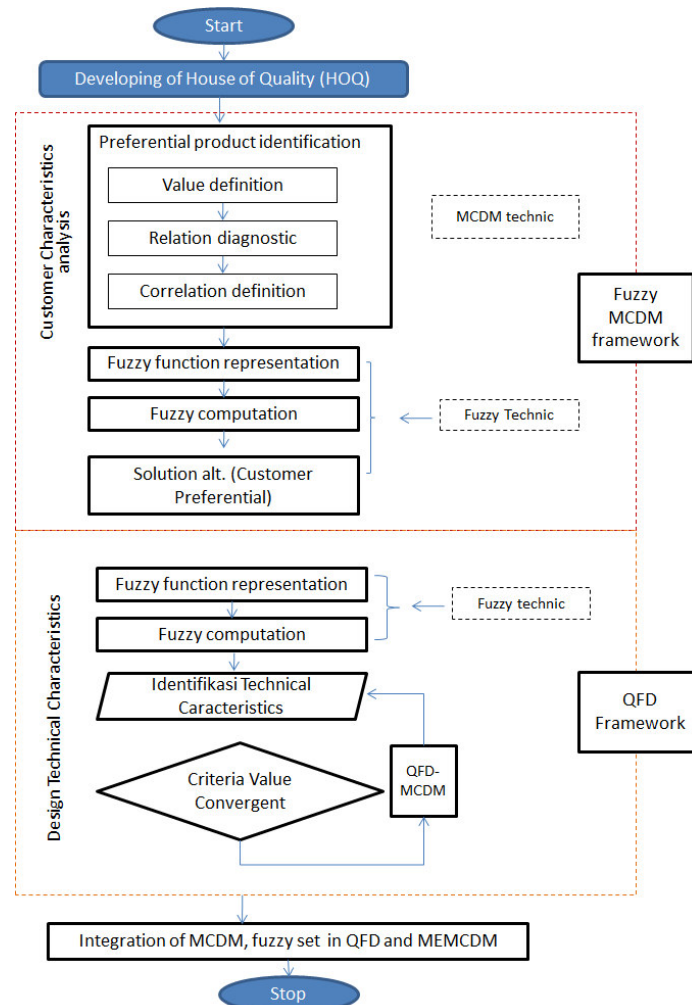


Figure 1. Research Framework

## 2.2 Method Analysis and Research Venue

The data in this study is divided into two stages, first the identification of Customer Requirement (CR) with Fuzzy Multi- Criteria Decision Making (MCDM) non-numerical, integration Customer Requirement (CR) and the Technical characteristics (TC) with Quality Function Deployment (QFD) and aggregation specialist with expert Multi Expert- Multi Criteria Decision Making (ME-MCDM). The study was conducted in traditional markets and cooking oil industry in Java began in October 2013 to October 2015. Total of the traditional market on the island of Java were 2842. The traditional markets in Jakarta are 153, Banten are 107, West Java are 539, Central Java are 881, DI Yogyakarta are 191 and East Java are 971. The distribution of questionnaires carried out in 30 (thirty) cities were sampled for distributing the questionnaire in 6 (six) provinces: Jakarta, West Java, Banten, Central Java, Yogyakarta and East Java.

## 3. Result

### 3.1 Recapitulation of Consumer Preferences

Consumer Preferences obtained from questionnaires. Consumer preferences then integrated with the technical characteristics of palm oil producers by using Quality Function Deployment (QFD). QFD was taken attribute list of Customer Requirement (Cr) from the resulting of market research, and turn it into a list Technical Characteristic (TC) which can be used by the manufacturers. The main contribution of QFD is to improve communication between marketers, designers and those parts production (Kotler, 2005). In order to gather consumer preferences regarding packed palm cooking oil products has accumulated by surveys in 30 city in Java island as much as 685 consumers.

Validity test results of questionnaires showed that consumer preferences for products packaged cooking oil need to pay attention to the 12 variables. Form of response from consumers includes four answer options are Very High (VH), High (H), Low (L) and Very Low (VL). Fourth choice answers are in fuzzy. Association members fuzzy in this study are the following equation (Liu, 2009).

$$\begin{aligned}
 VL(\text{Very Low}): (0, 0, 2), f_w(x) &= 1 - 0,5x & 0 \leq x \leq 2 \\
 L(\text{Low}): (0, 2, 4), f_w(x) &= \begin{cases} 0,5x, & 0 \leq x \leq 2 \\ 2 - 0,5x, & 2 \leq x \leq 4 \end{cases} \\
 H(\text{High}): (2, 4, 6), f_w(x) &= \begin{cases} 0,5x - 1, & 2 \leq x \leq 4 \\ 3 - 0,5x, & 4 \leq x \leq 6 \end{cases} \\
 VH(\text{Very High}): (4, 6, 6), f_w(x) &= \begin{cases} 0,5x - 2, & 4 \leq x \leq 6 \\ 4 - 0,5x, & 4 \leq x \leq 6 \end{cases}
 \end{aligned}$$

Fourth fuzzy set can be seen in Figure 2.

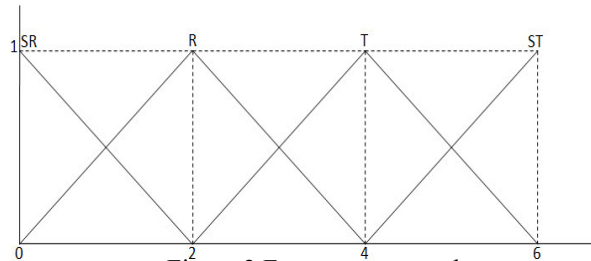


Figure 2. Fuzzy set *triangular*

Fuzzy Triangular is one type of fuzzy membership function which has an upper limit and a lower limit of input crisp fuzzy, where the value of lower and upper limits of the value of membership function is equal to 0 and one of top of the membership function is 1.

Based on the results of primary data collection from questionnaires in 30 traditional markets from as many as 685 respondents then recapitulated by weighting to generate consumer preference weights were calculated the formula (Liu, 2009).

$$(w_{1j}, w_{2j}, w_{3j}) = \left( \frac{1}{n} \sum_{k=1}^n w_{1jk}, \frac{1}{n} \sum_{k=1}^n w_{2jk}, \frac{1}{n} \sum_{k=1}^n w_{3jk} \right)$$

Recapitulation consumer preference weights are given in Table 1. Therefore, the dominant consumer preferences based on the formula (Liu, 2009) are: price packed palm cooking oil is not much different from the price of bulk cooking oil, the price of packed palm cooking oil affordable to all market segments, color of cooking oil is clear yellow, cooking oil added vitamin A or D, packaged cooking oil is available in various sizes, available ingredient lists on packaging, manufacturer and expiration period and finally packed cooking oil sturdy and not easily leak.

Table 1. Recapitulation consumer preference weights

Parameter	Criteria	membership degree	POSITION
PRICE	CR 1 The price of simple packaging palm cooking oil is not much different from the price of bulk palm cooking oil	wCR1a	0.5 (5.00, 6.00, 6.00)
		wCR1b	1
		wCR1c	0
PRICE	CR 2 Affordable by all segments of the market	wCR2a	0.5 (3.00, 4.00, 5.73)
		wCR2b	1
		wCR2c	0.3666667
PRODUCT QUALITY	CR 3 color of oil is clear yellow	wCR3a	0.5 (5.00, 6.00, 6.00)
		wCR3b	1
		wCR3c	0
	CR 4 flavourless	wCR4a	0.05 (1.10, 2.00, 3.00)
		wCR4b	1
		wCR4c	0.5
	CR 5 odorless	wCR5a	0.3833333 (2.77, 4.00, 5.00)
		wCR5b	1
		wCR5c	0.5
	CR 6 All stages of the production process of cooking oil in accordance with ISO	wCR6a	0.5 (1.00, 2.00, 3.00)
		wCR6b	1
		wCR6c	0.5
	CR 7 Added Vitamin A or D	wCR7a	0.5 (3.00, 4.00, 4.97)
		wCR7b	1
		wCR7c	0.4833333
CR 8 The production process is hygienic	wCR8a	0.5 (1.00, 2.00, 3.00)	
	wCR8b	1	
	wCR8c	0.5	
CR 9 Available in various sizes	wCR9a	0.5 (3.00, 4.00, 5.66)	
	wCR9b	1	
	wCR9c	0.3333333	
KEMASAN	CR 10 publish ingredients, producers and expired date	wCR10a	0.5 (3.00, 4.00, 4.97)
		wCR10b	1
		wCR10c	0.4833333
KEMASAN	CR 11 Sturdy or not easy to leak	wCR11a	0.5 (3.00, 4.00, 4.97)
		wCR11b	1
		wCR11c	0.4833333
KEMASAN	CR 12 ergonomic	wCR4a	0.05 (1.10, 2.00, 3.00)
		wCR4b	1
		wCR4c	0.5

### 3.2 Aggregation CR and TC in the QFD with MCDM

Quality Function Deployment ( QFD ) is a mechanism to identify the desires or needs of consumers Requirement (CR) then taking them into account of the technical characteristics (TC) from the manufacturers. Multi- Criteria Decision Making ( MCDM ) is one of the most important method of operations research that aims to design the tools of mathematics and computation to choose the best alternative among several people in connection with certain criteria with a single decision makers or groups (Yusro, 2013). Criteria are usually in the form of measures, rules or standards used in decision making (Kahraman, 2008). Weighting in the integration between Consumer Requirement (CR) and the Technical Characteristic (TC) is filled using expert opinion. Experts in this operation is Wilmar Ltd. (member 1), Astra Agrolestari Ltd.(member 2), Salim Ivomas Ltd. (member 3), Ministry of Trade (member 4) and Ministry of Industry (member 5).

The process of aggregation is also dedicated to the aggregation of the experts judgment. Aggregation of experts was conducted by using Ordered Weighted Average. Operationalization of the expert aggregation is operated by using the formula :

$$Q_k = \text{Int} \left[ 1 + \left( k * \frac{q - 1}{r} \right) \right]$$

Based on the results the weighted aggregation criteria found that weighted values for each expert is M1 = Int [ 0.083 ] = Very Low , M2 = Int [ 0.167 ] = Low , M3 = Int [ 0.167 ] = Low , M4 = Int [ 0.25 ] = High , and M5 = Int [ 0.333 ] = Very High

Furthermore, aggregation of expert opinion between the desires of Consumer Requirement (CR) and (Technical Characteristic (TC) of producers for each CR was performed using Expert Multi Expert- Multi Criteria Decision Making (ME-MCDM) using the following formula.

$$V_i = f(V_i) = \max[Q_j \wedge b_j]$$

Where : j = 1, 2, ..., m

Bj = The order value experts judgment to j

ME - MCDM is used because it is a proper technique in decision-making with a wide range of criteria provided for the best looking for an alternative based on the expert opinion contained in the form of a non-numerical (qualitative) of the situation (Yager, 2008). Expert opinion that has been given further aggregated by ME-MCDM as weight combined to obtain the final opinion in decision making. The results aggregating of expert opinion on each CR and TC can be seen in Table 2.

Table 2. the results aggregating of expert opinion on each CR and TC

AGREGASI PAKAR	TC1			TC2				TC3						TC4			Optimasi Maks			
	TC 11	TC 12	TC 13	TC 21	TC 22	TC 23	TC 24	TC 31	TC 32	TC 33	TC 34	TC 35	TC 36	TC 37	TC 38	TC 39		TC 41	TC 42	TC 43
CR1 (0.12)	R	R	R	T	T	T	T	T	R	T	T	T	T	R	R	T	T	T	T	12
CR2 (0.09)	T	T	R	T	R	R	R	T	R	R	R	R	R	R	R	R	R	R	SR	3
CR3 (0.12)	T	T	R	T	T	T	T	T	T	T	T	T	T	R	R	T	R	R	R	12
CR7 (0.09)	T	R	SR	ST	R	T	T	R	R	R	R	R	R	R	R	T	T	R	T	6
CR9 (0.10)	R	R	R	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	16
CR10 (0.09)	T	T	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	2
CR11 (0.09)	T	T	R	T	R	R	T	T	R	T	R	R	R	R	R	R	R	ST	R	7
optimasi max	5	4	0	5	3	4	5	5	2	4	1	3	3	2	1	2	4	2	3	

Based on the result of the aggregation of experts to TC can be seen that the three highest rank are TC 11 = Knowledge of HR operators, TC 21 = Processing Technology, TC 24 = Infrastructures and Supports Production and TC 31 = Implementation of Standard Operating Procedure (SOP) which ensures uniformity of the process. Furthermore, based on the results of the linguistic weighting in the CR found that the dominant criteria with the highest value to the Consumer Requirements (CR) are (CR 1) The price of packed palm cooking oil is not much different from the price of bulk cooking oil with a weight of 0.12, (CR 3) color cooking oil is clear yellow with a weight of 0.12 and (CR 9) packaged palm cooking oil is available in various sizes with a weight of 0.10. This is comparable with the results of the expert aggregation for maximum optimization ie CR 1=12, CR 3=12 and CR 9 = 16.

### 3.3 (CR 1) Consumer preferences packed palm cooking oil price is not much different from the price of bulk cooking oil

The high price difference between packed palm cooking oil and bulk palm cooking oil is caused by the cost of packaging and transportation costs. Transport costs in Indonesia are a significant role to increase in price by 20 %. very important attributes are considered the respondent or the community in the process of purchasing palm cooking oil products are price. consumers are choosing to buy bulk palm cooking oil is more sensitive to price (Supriyatna, 2006). This is because the bulk palm cooking oil has been selected by the low to middle income community. Spending on essential goods for the middle to lower income community in 2014 reached an average of 58.43 % of total their income per month. Based on survey data on public whose using bulk palm cooking oil in 30 traditional markets in Java showed that majority of consumers are housewives as many as 83.4 %. Housewives responsible for the provision of food and logistics at home.

The increasing price in packed palm cooking oil caused by factors packaging costs, fees and charges of transportation, addition of vitamin A if the application of SNI 7709 on December 31, 2018 be enforced. Packaging is a container or wrap can help prevent or reduce damage, protect the product is in it, to protect from the dangers of pollution and physical disorders (friction, impact and vibration) (Danger, 1992). The functions of the packaging according to Danger (1992) are : a. Protecting the product and keep it in good condition, b. Easily distributed economically, c. Effective cost. d. Sell the product.

One of the important things in the package is a trademark or logo packaging. Logo created not just as a trade mark or a symbol of the company, but must be able to represent the corporation and it is able to provide confidence (trust) in the shortest possible time. The logo should be memorable, impressive, distinctively and not too complicated (Supriyono, 2010). Meanwhile, logo or picture mark is an identity that is used to describe the image and character of an institution or a company or organization (Kusrianto, 2009). Logotype or word mark is the name of the institution, company, or product that is displayed in the form of special writing to describe a characteristic commercially. The Ministry of Trade to create a brand of simple packed palm cooking oil with the name MINYAKITA, it was to help oil producers and packers in making the logo and brand packaging. In addition, to save time and cost in the registration of the brand. Packaging MINYAKITA can be seen in Figure 3.



Figure 3. Brand of MINYAKITA

Based on the determination of Non-Tax Revenue (non-tax) from the Ministry of Justice and Human Rights that the registration fee of registration brand is approximately Rp 3,100,000, -. Thus the Ministry of Trade

has been providing assistance to cut costs of brand registration, so companies can freely to wear brand MINYAKITA on palm cooking oil packaging. The advantage can be taken by companies that have signed up to the Ministry of Trade is that MINYAKITA brand has been known since 2008, so it already has a brand image in the minds of the people of Indonesia. MINYAKITA brand has been positioned as a high quality cooking oil at a low price, so that people can already see the company and brand image. Thus, companies can get to know better the strength that was conceived from the packaging carefully designed to accelerate the company or product brand image. (Kotler, 1999).

The price of packed palm cooking oil which conversion from bulk palm cooking oil is targeting to middle to low income community, so the price is determined not aim for profit-oriented, but it is intended for the purpose of price stability. In a market there are consisting of very sensitive to price consumers, then the competitors will provide lower prices. Conditions such as these formed the underlying purpose of price stabilization in certain industries. (Tjiptono, 2002). Tax - allowance that may be provided by the government is a value-added tax exemption. The amount of tax allowance is 10% of the product price. But the magnitude of this tax may reimburse the cost of packaging, transport and the addition of product features eg the addition of vitamin A. As a general overview, for example, the cost of production per liter of bulk cooking oil is Rp10.000, -. The addition of value-added tax is 10 % of the production cost, the price paid by consumers is Rp 10,100, -. Furthermore bulk palm cooking is packed with a cost of 7% , distribution costs is 4% sebasar and the cost of adding quality features such as vitamin A by 1%. Then the addition to the price is 12 %. The price will be Rp 10,120, - in the hands of consumers with a 12 % increase in the cost. Thus the price of packed palm cooking oil in end consumers is not much different from the previous price of bulk cooking oil.

The magnitude of the sacrifice the government to subsidize the tax basically do not burden the government in the long term. This is because the packaging program in addition to maintaining hygiene, keeping of the troubled of the mixing, keeping peck measure and weigh it also facilitates traceability, it can also create jobs to make the packing plant. The local government can seize this opportunity as a great opportunity to open up employment opportunities ie establishing a packaging plant in the form of regional-owned enterprises. The number of packaging business units that can be established to pack as much as bulk cooking oil by 3.6 million tonnes, from 2014 until 2020 was as much as 406 packaging factory. Packaging plant are distribute to 116 units large company and 290 units SMEs packing plant. If it is assumed for the large-scale packing plant or company has a staff of about 150 people it will create jobs as many as 17,400 workers. Furthermore, if it is assumed for the small-scale packing plant or SMEs will have a staff of about 50 people then it will create jobs as many as 14,500 workers. Thus there are employment opportunities for 31 900 workers. It is significant enough to reduce the unemployment Indonesia about around 7.42 million people to 7.1 million people or 3.3% (CBS, 2015).

#### 3.4 Preferences of consumers want the color of paced palm cooking oil is clear yellow

Before 1973 Coconut oil dominated the market in Indonesia. Palm oil is derived from pressing Kopro through purification through chemical processes in the form of neutralizes with NaOH. The color of coconut oil is clear or white. High oil prices provide the opportunity to create palm oil substitutes. In fact, palm oil plants thrive outside their home areas, namely Nigeria, North Africa and Brazil, but also in Malaysia, Indonesia, Thailand and Papua New Guinea (Fauzi, 2002). Oil palm trees are very suitable and thrive in tropic areas. Since 1974, fractionation technology developed rapidly, RBD Palm Olein mentioned, it can be liquid at a temperature of 15-18 °C, but the color is yellow. To delight the eyes of Indonesian society with a clear color, then 95% of micronutrients - carotene (pro-vitamin A, and other anti-oxydant) discarded or extracted by the bleaching process. Bleaching aims to eliminate most of the coloring material insoluble or colloidal nature that gives color to the oil (Nagendran, 2000). Approximately 80% carotenoid lost during the bleaching process. Meanwhile, activated charcoal (bleaching agent) of 0.1% to 0.2% by weight of the oil can absorb the dye by 95% to 97% of the total dye contained in crude palm oil (Ketaren, 2005). Since 1979, appeared "marketing-jargon" palm oil is the "golden oil". A vigorous campaign to change the public perception that the oil was not only white but also yellow with a variety of advantages, especially the price.

SNI7709 in 2012 defines that palm olein is Foodstuffs with the main composition of triglycerides derived from palm oil, with or without chemical changes, including hydrogenation, cooling and has been through a purification process with the addition of vitamin A. The purpose of fortification is essentially adding micro nutrients on one or several foodstuffs in order to improve the nutritional value of foodstuffs. The addition of vitamin A in the palm olein is an activity that can be said wastage costs . This is because the content of palm oil has beta-carotene as provitamin A is high. The content of carotene can reach 1000 ppm or more, but in the oil of certain types are also only approximately 500-700 ppm, tocopherol content varies, depending on the handling during production (Ketaren, 2005). Cooking oil made from vegetable oils such as palm oil contains very rich in nutrients. In the palm oil is also rich in vitamins such as vitamin A, vitamin B1 and even vitamin C. What is important is the class of this oil contains antioxidant substances such as alpha - carotene, beta - carotene, gamma - carotene, vitamin E (tocopherols and tocotrienols), lycopene , lutein , sterols , unsaturated fatty acids which is very good for the body. Thus the addition of vitamin A in SNI7709 in 2012 needs to be re-examined, the word

"addition" was changed to "contain". Thus the content of vitamin A can be provided from natural or synthetically added. In the sense of the content of beta carotene or pro- vitamin A which is very high in palm oil is acceptable and in accordance with the SNI. Therefore, red palm oil became important alternative because it has activity provitamin A and vitamin E are very high. This character makes palm oil the red very well in terms of nutrients (Jatmika, 1998). However, the content of vitamin A can be lost because of high heat, thus the red palm oil is suitable for frying. This is because beta carotene will be denatured at temperatures above 200°C. Carotenoids contained in red palm oil provide the characteristic orange to red color. Carotenoids, especially  $\alpha$  - carotene and  $\beta$  - carotene is a precursor to vitamin A in the body (Nagendran, 2000). The red palm oil can be used to combat vitamin A deficiency because the content of  $\beta$  - carotene. Furthermore, it can also be used for the intermediate coronary heart disease and cancer, and replace cells that have been damaged. Engineering palm oil production process by reducing or eliminating the bleaching process has many benefits. In addition to the benefits of naturally rich in the nutrient content can also reduce the cost of production, so that palm oil can be kept affordable by the people of Indonesia among the middle to lower income, although the bulk oil is converted into packaging palm cooking oil.

Thus the SNI 7709 in 2012 will be a success to be applied on a mandatory basis through the Minister of Industry Decree No. 100 of 2015 on the application of ISO 7709 is required to be set from December 31, 2018. In preparation for the implementation of mandatory SNI so there should be education and promotion and dissemination at all places in Indonesia.

### 3.5 Consumer preferences wanted packed palm cooking oil is available in various sizes

Based on survey results, consumer of palm cooking oil are mostly women as much as 84.7 % where the average age between 36-45 years of as much as 31.3 % , with the majority is a graduate of Advanced Upper Secondary School (SLTA), and profession as housewife as much as 83.4 % of income per month is below 1.5 million by 58 %. Consumers with less income tend to buy in small quantities for just once cooking. This is reflected in the data processing that consumers want packed palm cooking oil is available in various sizes with a weight of 0.10. Variations of cooking oil packing size is 100 ml, 250 ml, 500 ml, 1 lt and 2 lt. GIMNI 2015 has analyzed the amount of cooking oil to be packaged by pillow pack variety pack sizes of 250 ml, 500 ml, one liter and 5 liter for restaurant. The results are presented in Table 3.

Table 3. Distribution of packaging palm cooking oil in 2016

	2016								
	National			Jawa dan Bali		External of Jawa-Bali			
	%	000 ton	000 pcs	000 Ton	000 pcs	42%	000 ton	000 pcs	
Packaging ¼ liter	52	2.171,9	9.625.104	1.211,3	5.367.847		960,7	4.257.258	
Packaging ½ liter	28	1.169,5	2.591.374	533,0	1.180.926		636,5	1.410.448	
Packaging 1 liter	12	501,2	555,294	436,1	483.106		91,9	20.361	
Packaging 5 liter	8	334,1	74.039	242,3	53.678		91,9	20.361	
<b>Total of packed palm cooking oil</b>	<b>100</b>	<b>4.176,7</b>	<b>12.845.812</b>	<b>58%</b>	<b>2.422,5</b>	<b>7.085.558</b>	<b>42%</b>	<b>1.754,2</b>	<b>5.760.255</b>

Table 3 shows the number of packs to be distributed annually as much as 12.9 billion packs, or an average of 1.1 billion packs/month. Based on the amount of packed palm cooking oil is required total amounts packaging machines about 533 units, assuming work 6 days/week and 21 hours/day or carried out by three shifts. The total investment to hold the packaging machine is Rp 1.464 billion.

Brand packaging specifications are in accordance with brand MINYAKITA it suitable with Trade Minister Regulation No. 2 of 2009 are: Packaging shape pillow (Pillow Pack) and Poly Plastic materials Ethylene (Mono Layer). General provisions Ministry of Trade Regulation No. 2 of 2009 is not compulsory or voluntary, the brand is Minyakita, with size of 1 liter, and the packaging is made by plastic and shaped pillow pack. Then Trade Minister Regulation No. 2 of 2009 has been revoked by issuing the regulation number 21 of 2015 on compulsory to packing palm cooking oil. Regulation of the Minister of Trade No. 21 in 2015 will be enforced on March 31, 2017. Thus the size, shape and type of packaging may be depend on the requirements of consumers and the ability of producers with regard to the quality of palm cooking oil in accordance with the standards of SNI 7709 in 2012.

In the packaging process palm cooking oil will involve agencies, manufacturers and packaging company. Manufacturers is a business unit that has a facility processing/ refining of palm oil into cooking oil. The packaging can use its own trademark (certification IPR) or use the trademark " Minyakita " Certified SNI and permits BPOM for Domestic Food. In order to save on transportation costs, the company's packaging should be close to the market. In this case the palm cooking oil produced in processing plants and distribute cooking oil using tanker trucks. Furthermore, the palm cooking oil will be packed in the factory packaging which the place close to the target market. This is because at present the company manufacturers already have a lot of tank trucks



and it would be better if reused and packed in the district or at the distribution center both distributor and agent of palm oil.

Traceability and product warranties need to be maintained even though the factory packaging and processing of palm oil producers are separate and distinct legal entities. Efforts to ensure the quality of palm cooking oil from producers to the end consumer below.

1. There should be a Working Agreement between Producers and packers under Notary
2. There is a bond - the supply contract between packers and manufacturers, are reviewed every 3 months about the number/volume (Rolling Projection) between the two parties, including the terms of payment
3. The price reviews every week
4. Manufacturers guarantee the quality of palm cooking oil every Lot Delivery, when oil out of the factory, with the certification of laboratory tests witnessed together
5. Packers, will be responsible for the quality of palm cooking oil were packed and on the packaging shown own trademark, logo SNI and MD numbers and addresses Packers
6. Both parties agree, that the manufacturer must be able to provide technical assistance when requested by packers with mutually agreed charges
7. And others required by both

Investment for fixed assets is for the purchase of land, storage tanks, buildings, warehouses, scales, test labs, offices and office equipment, for example, plus 3 units of filling and packing machine is needed around Rp 9 billion. This is not including Interest During Construction (IDC) and a working capital of around Rp 2.6 billion. Thus the packaging company is better in form of the Corporation so that VAT input and VAT output could be taken into account/off - set so it does not become a burden. With the magnitude of the packaging plant investment capital it needs from the government also Capital Support to Small and Medium Enterprises (SMEs) or set up a Regional-Owned Enterprises (enterprises). Without capital of cooperatives or enterprises, the pattern of the public health improvement by presenting the packed palm cooking oil (hygienic) and add-vitamin for the Indonesia citizen will be difficult to reach.

The character of this packaging business, 90-92 % of raw materials is oil so need special skills in doing the packaging. Therefore, the success of such businesses, only can work when all employees can work with high efficiency. It needs training, high working accuracy. Thus it need to hold job training. Thus TC 11 = Knowledge of HR operators, TC 21 = Processing Technology, TC 24 = Infrastructures which Supports the production and TC 31 = Implementation of Standard Operating Procedure (SOP) which ensures the uniformity of the process becomes very important to be improved in order to answer the desire guarantee consumer health and affordability objectives packed palm cooking oil as resulting from the conversion of bulk palm cooking oil to packed palm cooking oil.

#### 4. Conclusion

Recapitulation CR found that the greatest weight is (CR 1) The price of packed palm cooking oil is not much different from the price of bulk palm cooking oil with a weight of 0.12, (CR 3) cooking oil color is clear yellow with a weighting of 0.12, and (CR 9) packaged cooking oil is available in various sizes with a weight of 0.10. Based on the result of the aggregation CR and TC using ME-MCDM then obtained criteria dominant note in the program conversion policy of bulk cooking oil to the packaging are: knowledge of human resources, processing technologies, facilities and infrastructure that support the production and adoption of Standard Operating Procedure (SOP) which ensures uniformity of the process. The study established that the price can be minimized by the subsidy PPN Dtp is 10%. Packaging design should meet at Minister of Trade regulation number 2 in 2009. The shape, packaging materials, designs and sizes left entirely to the manufacturer palm olein or a packaging company. The packaging are available in different sizes of 100 ml, 250 ml, 500 ml, 1000 ml and 2000 ml. Cooking oil color is widely known today is a clear yellow, the yellow color is the result of the marketing education palm olein for replacing the image of a coconut cooking oil which previously was white. Therefore, the color can be imaged to consumers through marketing strategies. SNI 7709 in 2012 which stated that palm cooking oil is Foodstuffs with the main composition of triglycerides derived from palm oil, with or without chemical changes, including hydrogenation, cooling and has been through a purification process with the addition of vitamin A. The addition of vitamin A should be reexamined, of the word "addition" was changed to "contain". Thus the content of vitamin A can be divided from natural or synthetically added. In the sense of the content of beta carotene or pro- vitamin A which is very high in palm oil is acceptable and it in accordance with SNI.

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