

A CASE STUDY ON COOKING OIL MANAGEMENT IN UNIVERSITY CAFETERIA: RESEARCH FRAMEWORK

NOOR, N. A. M.

*Faculty of Science, University of Malaya, Jalan Universiti, 50603 Kuala Lumpur, Wilayah
Persekutuan Kuala Lumpur, Malaysia.
e-mail: rappum8[at]gmail.com*

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Abstract. Research framework becomes an important guideline as starter phase to a particular research study. Research framework involve with introduction that have connection with issues and problems statement, methodology will concentrate on methods involve in collecting data, result with discussion part are involve with analysis data in producing result and discussion towards the result in solving the issues and problems, and conclusion will be highlighted on the summary of finding for the research. Based on this study, the research conducted in a smaller scale that only concentrated on university perspective. However, this research study can be enhance and develop into larger scale which involve with national perspective in managing the waste cooking oil, and indirectly help to control pollution in environmental perspective.

Keywords: *research framework, introduction, methodology, result and discussion, conclusion*

Introduction

In a global world, cooking oil is used for the preparation of food. Cooking oil is a plant, animal, synthetic fat used in frying, baking and other types of cooking. Scientific definition of cooking oil is glycerol esters of fatty acids. Common types of cooking oil use by Malaysian are palm oil, peanut oil, corn oil and sunflower oil (*Figure 1*). They are used as a heat-transfer medium in frying to generate nicely cooked foods. Cooking oil is typically liquid, although some oils that contain saturated fat such as coconut oil, palm oil and palm kernel oil are solid at room temperature (*Figure 2*).



Figure 1. *Type of common cooking oil used by Malaysian.*

Type of fat or oil	Products
Animal fats	Lard Suet
Vegetable oils	Olive Sunflower Soya Corn Cotton Rapeseed Peanut
Vegetable fats	Palm Cabbage palm Coconut
Fractions	Cotton stearin Palm olein Palm stearin
Hydrogenates	Hydrogenated fish oil Hydrogenated palm olein Hydrogenated soya oil

Figure 2. Main types of fats and oils used as cooking oil.

Malaysia is among top three exporter of palm oil in the world. About 40% of palm oil mostly made into cooking oil, margarine, specialty fats and oleochemicals. Major of cooking oil made from palm oil. Meanwhile, used cooking oil term refers to cooking oil that is no longer used in food production. The main producers of used cooking oil are the restaurants, food stalls, night market also cafeteria. The disposal of cooking oil becomes a huge problem because of fried food such as fried chicken, French fries and burgers can produce as much as 15 litres of used cooking oil per day not including restaurants that provide Malay food. There are more than hundreds of restaurants in Malaysia and larger volume of used cooking oil is generated per day (*Figure 3*).



Figure 3. Production of used cooking oil.

Production and consumption of cooking oil causes the amount of waste cooking oil generated also increases. *Figure 4* indicate the cooking oil allocation in Malaysia was reported 7000 tonnes a month in 2010 (Akademi Science Government, 2012).

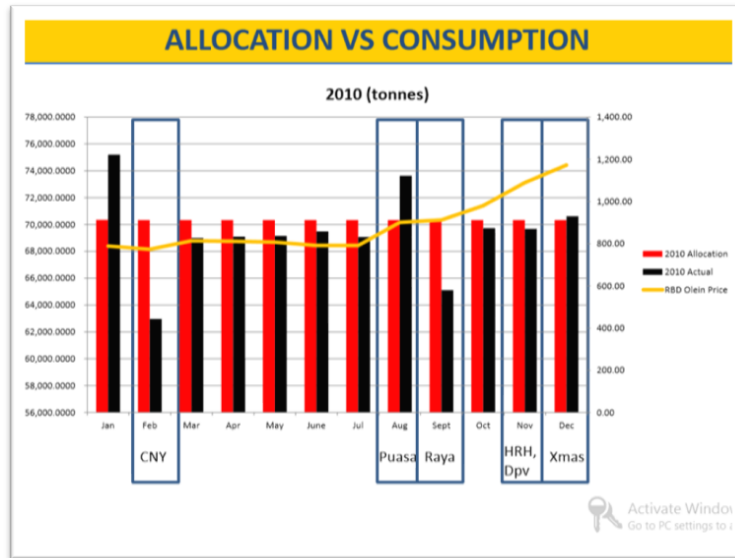


Figure 4. Graph of consumption versus allocation of cooking oil in 2010.

This figure showed the allocation of cooking oil versus consumption of cooking oil on 2010. We can see that the highest consumption of cooking oil on January and also on Ramadhan month with more than 73, 000 0000 tonnes. This is because although it fasting month but many restaurant, hotel, night market or “Bazar Ramadhan” will open on evening that provide several type of food. This is a major factor why the graph of consumption cooking oil drastically increasing. Meanwhile, according Cooking Oil Subsidy report from Akademi Sains Malaysia (Akademi Science Government, 2012), there are top 8 Malaysian favorite foods. Table below show the top 8 Malaysian favorite common foods (Table 1).

Table 1. Top 8 Malaysian favorite food.

Favorite food	Oil per serving (gram)
Nasi Lemak	10
Nasi goreng	10
Kuew teow goreng	15
Mee goreng	10
Chicken curry	5
Pisang goreng	5
Curry puff	5
Roti canai	10

Source: Akademi Sains Malaysia (2012).

It not includes deep frying meat-based products such as Kentucky Fried Chicken, McDonald, Burger King, “keropok lekor”, fish cakes and sausages. Majority of Malaysian people especially kids and teenagers like deep fried foods due to their taste, smell and texture. Frying is also one of the easiest and cheapest ways of cooking. Even though a little amount of potential toxic products such as polar compounds or polymers are produced during frying, fried foods are considered safe. However, it becomes toxic for human consumption if the frying oil is used repeatedly (Artman, 1969). It was reported that waste cooking oil is widely produced all over the world (Kulkarni and Dalai, 2006). Improper waste management of cooking oil leads to discharge of waste

cooking oil to environment and this will effect environment and danger to human health. The increasing production of waste cooking oil from household or food industrial source is growing problem in Malaysia. The waste cooking oil is regularly poured down directly to sink or drain resulting in problems for wastewater treatment plants. Fat, oil and grease cause major problems to drain and sewers. When they are discarded of down kitchen sinks or drains they cause blockage. Meanwhile they cause pollution in streams and rivers when they enter rainwater pipes. Oils and grease may cause the clogging of the pipes because they stick to the inner walls and reduce the diameter of the sewer pipes. Sewage spills will occur when the layer is thicker. Then worst condition is it will disrupts normal operations if the oil reaches the wastewater treatment plants and both maintenance costs and the rates to be paid for the purification of the water will increase (Payri et al., 2005).

The eating habits of the nation are changing; people are eating out much frequently than they did in the past. Majority of the preferred to eat outside home and it cause the number of food business is increasing. One more major problem of Malaysian people either in household or food business sector, repeatedly usage of the same frying oil becoming a common practice which is mainly intended for cost saving or budget constraints. Few related articles to this hot topic have been published previously also mentioning the seriousness of this practice to the human health.

According to literature review, the oil is discarded only when the oil becomes foamy, produce bad smell or when the color of the repeatedly used oil turns dark (Azman et al., 2001). In addition, the consumption of repeated usage cooking oil is unhealthy and mallicious to consumers because cooking oil is heated to a temperature of 170-220 degrees Celsius during frying. Upon heating, cooking oil may undergo chemical reactions, hydrolysis, oxidation and polymerisation. Degradation products such as free fatty acids, hydroperoxides and polymerised triglycerides may be formed. Besides, the viscosity of the cooking oil will increase; its colour will go darker and rancidity will also develop, giving rise to unpleasant flavour as a result of oxidation. Recent study conducted showed that consumption of repeatedly heated cooking oil resulted increased blood pressure and necrosis of cardiac tissues in experimental rats. The increase in blood pressure due to consumption of repeatedly heated cooking oil might be due to quantitative changes in endothelium dependent and independent factors including enzymes directly involved in the regulation of blood pressure (Azman et al., 2001).

Using of repeatedly used oil can cause adverse effect to the human health. However, this practice becomes common among Malaysian without their aware that this type of oil can harm the human health (Kulkarni and Dalai, 2006). Many local communities are not aware the issues due to lack of information and knowledge of waste cooking oil management especially for food outlet business operators, a step must be taken to overcome it. However, it has can be recycled and has potential as value-added products such as biodiesel, lubricants, biopolymers or soap. The survey process also proves that the hazardous effects of waste cooking oil to human health and environment. The Malaysian Food Act and Regulations, September 2005 has no provision and regulatory for cooking oil quality. Food safety, which includes aspects of food handling and food processing, are addressed by specific food safety programme such as Good Manufacturing Product (GMP). Member countries look toward Codex Alimentarius to set food standards or guidelines in global country. However, Codex has not yet developed guidelines for fried oil quality (Government of Malaysia, 2005). Fortunately, there are great potential in the recycling of used cooking oil, which attract interest in the

collection process for the production of biodiesel. Used cooking oil into biodiesel it is possible by recycling to generate income source and reduce environmental pollution and fossil fuel dependence. However, everything has a risk. The biggest risk of recycling this used cooking oil is its collection, mainly due to the high costs. For a company or a local administrative unit that wishes to make the collection is difficult to do because they need through standard waste collection methods (Wang et al., 2006).

Objective of study

The objective of the study can be divided into several, namely;

- (1) To determine the level of awareness of food cafeterias operators towards proper waste cooking oil management.
- (2) To investigate the practice of cafeterias operators regarding the usage of repeatedly cooking oil.
- (3) To know level of knowledge of repeated usage of cooking oil towards human health among food business operators.
- (4) To investigate the effect of repeatedly usage of cooking oil towards human health.
- (5) To study the potential of used cooking oil recycling towards biodiesel production.

Materials and Method

Research background

The study was conducted in cafeterias throughout in the university campus. The total of cafeteria in the university was 39. However, only 20 cafeterias were selected because they are person that willingly to give cooperation. Some of the owner of cafeteria not gives cooperation. This figure below showed the map of cafeterias that operate in university (*Figure 5*).

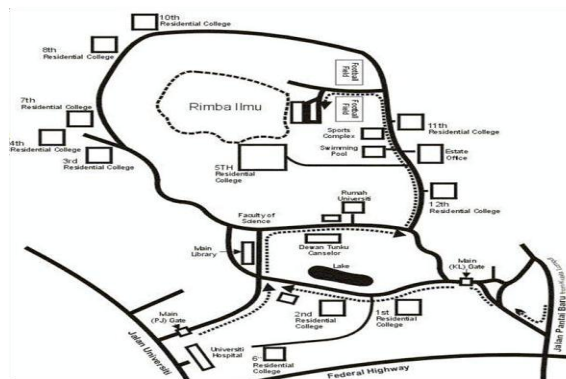


Figure 5. The map of cafeterias that operate in university.

Study design

This was a cross sectional study and was conducted in the area in one of the government university throughout timeframe of the month of Mac until April 2014. 20 cafeterias from 39 cafeterias were chosen for this project (Hua, 2016a and 2016b) (*Figure 6*).

Location	Type of stalls	No. of stalls
Food Junction	Malay cuisine, hot dishes, Iranian food, drink and beverages	5
Food Court Village	Hot dishes, Iranian food, fried food, Malay cuisine	7
Kompleks Perdana Siswa Cafeteria	Salad stall, pizza stall, western kitchen, breakfast stall, local lunch stall	5
12 th Residential College Cafeteria	Malay cuisine, hot dishes, western, roti canai, hot dishes	5
11 th Residential College Cafeteria	hot dishes, western, Malay cuisine	3
10 th Residential College Cafeteria	hot dishes, western	2
9 th Residential College	Hot dishes	1
8 th Residential College	hot dishes	1
7 th Residential College	Char kuew teow, burger, hot dishes	3
5 th residential College	Hot dishes, hot dishes	2
4 th Residential College	western, hot dishes	2
2 nd Residential College	Malay cuisine, hot dishes	2
1 st Residential College	Hot dishes	1

Figure 6. Raw data of location, type of stalls and no of stalls throughout the university's cafeteria.

The survey were distributed to 20 cafeterias throughout in the university, which include café that are located in student's residential areas such as 4th college, 5th college, 7th college, 11th college and 12th college. Some of residential college doesn't have their own cafeteria such as 3rd College and 6th college (Figure 6, 7 and 8). The survey also conducted in faculty of Science, Islamic Studies Academy and students lounge areas which renamed it as Complex Mall to survey the attitude of the respondents towards the awareness in the used of cooking oil management. Personal information or personal biodata (most like known as demographic profile) like races, type of food business in each cafeteria, gender of participants were recorded as supplementary information. The main questions such as volume of waste cooking oil consumed per day, the frequencies of the waste cooking oil being used repeatedly, the method disposal of used cooking oil by respondents and the level of knowledge regarding repeated usage of cooking oil towards human health were asked to all respondents. Survey was done by site visit and by face-to-face interview. The data were collected, evaluated, analyzed and depicted in the form of pie charts. Advanced analysis will also be conducted like correlation analysis, ANOVA analysis, *chi-square* analysis, factor analysis, etc., in define for the future plan in waste cooking oil management in university.



Figure 6. Food stalls in Food Court Village.



Figure 7. Cafeteria in Kompleks Perdana Siswa.



Figure 8. Cafeteria in Fifth Residential College.

Conclusion

The report of research framework entitled „Cooking Oil Management in Cafeteria Operator:

A Case Study in University Perspective“ is conducted to determine the effectiveness of methodology in collecting data to answer and support the objective of study and achieve the research study. Even the target and scope of the study are smaller (minor), the impact of research contribute will „repair“ the procedure in treating waste cooking oil in university. On the other hands, this research study can be enhance and develop into bigger scale, which concentrate on country perspective and the contribution on the research will help in managing and controlling the waste cooking oil. Indirectly, this approach will positively impact towards environmental in reducing the pollution perspective.

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