

# Society's Response and Management of Palm Oil Industry Waste in Pasangkayu Regency

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**Abstract.** Palm oil has become one of the fastest growing commodities in the world. Pasangkayu Regency is one of the areas that relies on the palm oil industry as the mainstay of the economic sector. Bountiful palm oil plantation increases the growth of the palm oil industry which leads to the waste production. This research was aimed to perceive the palm oil industry waste management system and examine the society's involvement and response to the waste utilization. Descriptive method was employed in this research. Then, the sample of this research was one of the palm oil industries in Pasangkayu Regency which was chosen purposively (Purposive sampling) and the society around the mill was determined proportionally based on the socio-cultural area of the society. The results revealed that the company adopted Technological Approach to overcome solid waste production and Socio-Economic Approach by involving the society indirectly. The response of the society around the company indicated that the existence of the palm oil industry and its waste production had a positive impact on the society. The company managed about 50% of solid waste and the rest was responded positively by the society as it was utilized for various purposes.

**Keywords:** Contamination, Palm Oil, Industrial Waste, Society's Response.

## 1 Introduction

Over the past few decades, palm oil (*Elaeis guineensis*) has become one of the most rapidly growing equatorial plants in the world, the latest total area of cultivation is nearly one-tenth of the world's permanent agricultural [1]. Palm oil has been the most widely produced and consumed vegetable oil in the world [2].

Indonesia has the potential to become a major supplier of biofuels, especially palm oil-based biodiesel, for the world market. In 2006, Indonesia had 4.1 million ha of palm oil plantations, 31% of the total world area [3]. West Sulawesi Province is one of the second largest palm oil producers in Eastern Indonesia. West Sulawesi has great potential in the palm plantations area with 72,506 hectares producing 226,178 tons. Pasangkayu is a regency government located in West Sulawesi Province. Pasangkayu Regency is one of the areas that relies on the palm oil industry as a mainstay commodity in its economic sector. In the economic sector, Pasangkayu depends on the agricultural sector in which plantation becomes the main economic growth engine. Production of plantation crops, especially palm oil, is very potential since it is the largest in West Sulawesi with a production of 109,570 tons per year. In 2008, the total palm oil obtained from 29,982 hectares plantation area was 109,570 tons [4].

The rapid growth of the palm oil industry in Pasangkayu Regency is proven by the establishment of various companies. The existence of the palm oil industry sector in residential areas can be the economic driver of the surrounding society. Industrial sector, especially in developing countries, that is highly dependent on environmental resources can cause pollution [5]. Gas emissions are often not reported. If the waste produced from this process is not managed properly, it will cause adverse environmental impacts including contamination of land and aquatic ecosystems, loss of land and resources, negative impacts on micro soil flora and fauna and loss of biodiversity.

Given the abundance of palm oil by-products, sustainable management of these by-products is needed for sustainable development. It is due the fact that waste from biological process, composting process, and compost can be the appropriate alternative for sustainable waste management [6-8]. The utilization of waste into a product can reduce environmental damage and give positive impact on the industry and surrounding society. This activity can minimize the negative impacts of palm oil waste and optimize the positive impacts on the community.

The development of palm oil plantation is positively correlated with society's perceptions that are influenced by the individual characteristics of the society [9]. The perception of the surrounding society as one of the important stakeholders in the development of palm oil plantations can be used as a new variable in the management of sustainable palm oil industry. That is because the surrounding society acts as an element that directly feels the economic, social and environmental impacts of the development of private palm oil plantations [10]. The development of the palm oil industry in Pasangkayu has affected the society socially and economically. Therefore, this study was aimed to perceive the management system (processing and utilization) of the solid waste from palm oil industry in Pasangkayu Regency and examine the society's involvement in the environmental-based management of solid waste from palm oil industry.

## **2 Material and Method**

The study was conducted in PT. LSS palm oil industry in Sarudu Subdistrict, Pasangkayu Regency, West Sulawesi Province. The research site was chosen purposively considering that it is the largest palm oil processing mill in Pasangkayu Regency with an area of 10,000 Ha. This Palm Oil Mill produces the most waste yet its waste management system has not been optimal (result of the initial survey). This research was conducted in April to October 2018.

The sample in this study was chosen purposively (purposive sampling) and it consisted of 4 (four) people from different position such as manager, manager of production sector, and employees of the solid waste processing department. While the sample of the surrounding society around the palm oil mill was determined purposively based on the social/cultural area of the community consisting of 6 (six) ethnic groups namely Mandar, Bugis, Makassar, Javanese, Lombok, and Balinese.

The sample based on the ethnicity consisted of 30 people which were determined by using proportional sampling. The other informant was the Village Head considering his ability to know the problems that existed in the site. The data used in this study were primary and secondary data. The data collection techniques were Interview, Observation, and Focus Group Discussion (FGD).

The method employed in writing this scientific paper was descriptive research method. The stages in writing this article included the formulation of problems to be developed into ideas,

data and related facts collections, data and facts verification, conceptual analysis with rational argumentation, formulation of ideas and conclusions and recommendations related to problem solving.

### 3 Result and Discussion

#### 3.1 The Company Overview

The name of the company is PT. LSS and the type of its legal entity is Limited Liability Company (PT). This company is located in Sarudu Subdistrict, Pasangkayu Regency, West Sulawesi Province. The business field is Plantation Activities & Palm Oil Processing Mill Management; the statement letter of EIA approved by Environmental Permit No. 85 of 2013 upon the revision/add of documents AMDAL No.107/ANDAL/ RKL-UPL/BA/VIII/96. The types of production include of Fresh Fruit Bunch (FFB), Crude Palm Oil (CPO), and Kernel. The year of establishment was in 1990 (land clearing), fresh fruit bunch was harvested in 1997, and the year of mill operation was in 1997. The location of the company can be seen in Figure 1.



Fig. 1. Business Location Map of PT LSS Plantations.

#### 3.2 Solid Waste Management by the Company

The following are some approaches adopted by the company to manage the solid waste from the operation activities performed in the mill:

- a) Technological Approach: optimize the use of "empty fruit bunch", fiber and shell as mulch and fertilizer palm oil plants, and optimize the use of shell and "empty fruit bunch" as boiler fuel.
- b) Socio-Economic Approach: provide garbage can and landfill for domestic waste and take the waste away once a week to landfill; provide "empty fruit bunch" shredder; keep B3 waste such as paint cans, used oil, used factory equipment, accumulator and others in special places; turn in solid waste (B3) to companies that have a permit from the Ministry of Environment; implement the Cow-Palm Oil Integration System by providing livestock facilities for the surrounding society.

The company applied bunch press technology in the processing of "empty fruit bunch" to reduce the level of oil in the "empty fruit bunch". Thus, it could reduce the level of pollution and decompose empty fruit bunch more easily. Actually, this is not required in the regulation because "empty fruit bunch" can be directly applied without having to be managed. However, the company feels some concern about the environment that leads to the implementation of this program.

### 3.3 Respondents' Characteristics

In this study, the respondents' characteristics from the elements of society were explained based on age, education, and employment status. The respondents' characteristics can be seen in Table 1.

**Table 1.** Society's Characteristics

Respondents' Characteristics	Note	Total Respondent	Percentage (%)
Respondents based on age group	30 – 41	5	16.67
	42 – 53	18	60.00
	54 – 64	7	23.33
Respondents based on education level	Elementary education	16	53.34
	Junior high school	7	23.33
	Senior high school	7	23.33
Respondents based on employment status	Farmer	29	96.67
	Employee	1	3.33

The respondent's identity based on age indicated that the average respondent was 48 years old. In general, the age level of respondents in the society around the palm oil processing industry is included in the productive age category.

Education is one of the factors that can influence the attitudes and behavior of respondents in utilizing palm oil processed waste [11]. The lowest level of education of the respondents was elementary school and the highest level was high school. Most of the respondents are elementary school graduates indicating that the average education level of the respondents is in the low category.

Social status represents someone's position which is measured based on the types of job. The level of social status based on the types of job consists of professional worker, technical worker, administrative worker, entrepreneur, service employee, and labor. In general, the respondents' identity based on social status/ employment status is included in the employee category; most of the respondents are farmer.

### 3.4 Society's Response to Industrial Waste from Palm Oil Processing

Utilizing waste into a product can reduce environmental damage and give some positive impacts on the industry and surrounding society. The role and involvement of the society are needed to maintain life sustainability by preserving the environment around the residential area. Various participation that reflects the society involvement in the utilization of palm oil solid waste can support environmental sustainability.

Society response to palm oil industry waste represents the society's perception of the mill existence in which they participate in waste management. Based on the interviews with the society around the palm oil processing industry, most of the respondents said that they have felt the impact of palm oil waste management for about 20 years. Various social problems have occurred related to the development of the palm oil sector. In Southeast Asia, the related problems have been documented in various publications [12-14]. Many of these problems highlight the issues of land use, land tenure and years of service, and how those rights are transferred. These problems are commonly found in other agricultural sectors, but the areas with rapid modernization and changes from basic subsistence to modern commercial crops or industrial agriculture tend to be problematic. Nevertheless, the response of the society regarding the existence of the palm oil industry was very positive, as shown in Figure 2.

Respondents' Perception About the Existence of Palm Oil Processing Mill (%)

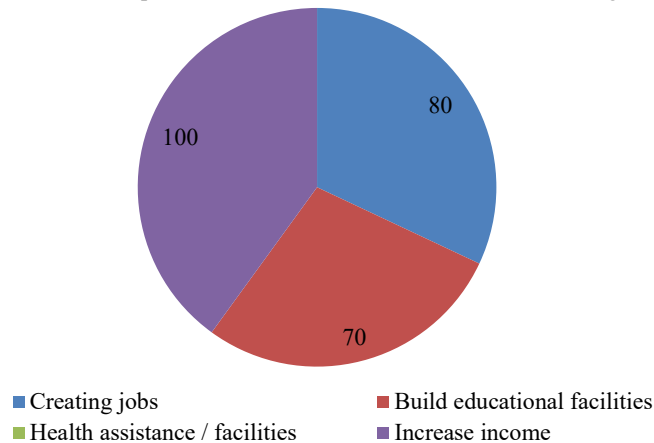


Fig. 2. Society's Response to the Existence of Palm Oil Processing Mill.

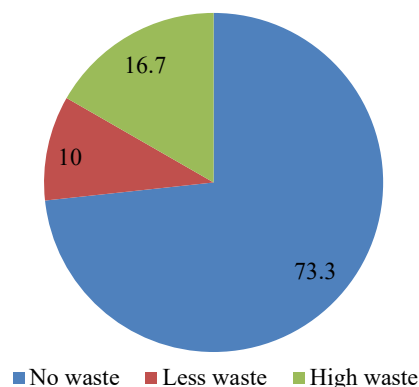
On the positive side, palm oil cultivation has an important role in poverty alleviation for small scale farmers and rural populations in Indonesia and Malaysia [15]. PT. LSS has provided employment opportunities for the society, supported construction activity, and provided educational facilities such as elementary school buildings. In addition, this company has created the markets for palm oil production in the surrounding society. Thus, it can be said that the existence of palm oil processing mill has received a positive response from the society.

Palm oil processing mill gives some positive impacts such as increasing farmers' income and improving the welfare of rural communities. However, it still has negative impacts on water and air pollution. According to Clay [16] the main environmental problems arising from the production of palm oil as conversion habitats are threats to critical habitats for endangered species, forest and land fire, air pollution, soil erosion, pesticide use, and fertilizer use.

### 3.5 Society's Response to Waste Volume

Society's responses to waste volume caused by the palm oil industry were grouped into three statements of "zero waste", "less waste", and "large amount of waste". The percentage is shown in Figure 3.

Society's Response to Waste Volume around the Palm Oil Processing Mill (%)



**Fig. 3.** Society's Response to Waste Volume.

Based on the data of society's response, 73.3% respondents claimed that there was no waste produced by palm oil industry (zero waste). That was due to the society's perception of the utilization of solid waste. Solid waste from palm oil industry can be utilized into something else. Therefore, people do not consider the remaining products as waste anymore. Types of waste mentioned are "empty fruit bunch", palm oil shell, and palm fiber. According Pahan [17] palm oil waste is the remnants of palm oil products that are not included in the main product or are the by-products of palm oil processing in the form of solid or liquid waste. Palm oil solid waste can be in the form of empty fruit bunch, shell and fiber.

Continuity of the presence of waste produced by palm oil processing industry is categorized as frequent category. All respondents explained that the palm oil industry waste occurs every week and it accumulates into waste heap found in many spots. Siradjuddin [18] in his research also confirmed that the waste produced from palm oil processing will have some negative impacts on the environment such as the quantity and quality of natural resources, and the environment.

The increasing activity of the palm oil processing industry will have a negative impact on the preservation of the surrounding environment. Thus, it requires society's involvement to control and manage the environment. Environmental problems occur when the environment changes. The changes can give negative impacts on the health and well-being of humans and other creatures directly or indirectly. Therefore, society's response is needed to determine further steps related to waste management.

Based on the data of society's response to the level of pollution of solid waste around the palm oil processing factory, 73.3% respondents stated that there was no contamination, while 16.7% respondents stated that the pollution level was high. Actually, the presence of contamination is not the most important issue. Instead, there must be immediate response to the utilization of solid waste volume since not all waste causes pollution. The dominant palm oil industry solid waste includes empty fruit bunch and shell; both types of solid waste are of high

volume. Most of the respondents thought that percentage of solid waste utilized for industry was still 50%. Thus, society's involvement is needed to manage and handle the rest of it optimally. There are about 26.27% of respondents who expect guidance from the company and the government about waste management techniques in order to give positive impacts on the surrounding society. Thus far, the society has used palm oil industry solid waste for palm oil fertilizer that is spread conventionally on the plantations (Figure 4.) and mixture of charcoal briquette or alternative fuel. Charcoal briquette is made from other types of charcoal that are crushed and compressed as needed with a mixture of starch; raw material for charcoal briquettes is from palm oil shell. The raw material of charcoal can be seen in Figure 5.



**Fig. 4.** Utilization of palm oil empty fruit bunch as fertilizer which is spread conventionally.



**Fig. 5.** Palm Shells as Raw Material for Charcoal Briquettes.

#### **4 Conclusion**

The strategies adopted by PT. LSS were using the principles of reuse and reduce. Utilization of empty fruit bunch for land application was about 45%, while the remaining 55% was applied to farmers' plantations. The responses of society around PT. LSS palm oil industry to the involvement in waste management (processing and utilization) were: (a) The presence of palm oil mill had some positive impacts on the surrounding society, in terms of hiring employee, supporting the construction, and providing educational facilities such as elementary school buildings, and creating markets for palm oil production; (b) The type of waste at the sites around

the mill was solid waste in the form of empty fruit bunch, shell, and fiber. The volume of solid waste produced was categorized as high; (c) The society has not been directly involved in managing factory waste. The mill involves the community indirectly by using their transportation facilities when transporting factory waste.

#### 4.1 Suggestion

The society expects guidance from the company and the government about waste management technique in order to give some positive impacts on the surrounding people.

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