



Impact of Palm Oil Waste Management Activities in Arongan Village, Kuala Pesisir District, Nagan Raya Regency

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Abstract

Background In general, waste is the residual product from the production process of materials that do not yet have economic or practical value in manufacturing or use. This study discusses the impacts caused by waste, including positive, negative, conscious, and unconscious effects. The purpose of this study is to examine the types of impacts generated and to determine the levels of pollutants present in palm oil waste.

Methods This research uses a qualitative approach, with data collected through documentation, observation, and interviews. The data were analyzed using descriptive and analytical methods with an inductive reasoning approach, based on information from ten sources, including the head of PT Socfindo, factory employees, and residents of Arongan Village who assessed the environmental impact of palm oil waste.

Results There are several benefits from the positive impact of waste management, including its potential to be processed into fertilizer, and because the resulting waste pollutant does not have a polluting effect on the environment. This is due to the pH, BOD, COD, and TSS of the resulting fatty oil still being low and not exceeding quality standards.

Conclusions Based on the data obtained, the authors conclude that the characteristics of the waste produced by the palm oil mill owned by PT Socfindo in Arongan Village are good and appropriate. As for the realized impacts, one of them is the odor generated and the holding pond's barrier that has not met usage standards. PT Socfindo has drafted a plan for constructing pool barriers, but the process has not yet been implemented.

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Keywords

Impact; Management; Waste; Palm Oil; PT. Socfindo

Introduction

This research examines the impact of palm oil waste management activities in Arongan Village, Nagan Raya District. Waste, in this context, refers to leftover products that have no economic or use value after the production process, such as waste water from factories, leftover materials such as rubber, wood, plastic, paper, and the like. Waste can be of natural origin or generated by human activities. Furthermore, waste can contain hazardous or toxic materials that, either in nature, concentration, or amount, can potentially endanger the environment, human health, and the survival of other living things, either directly or indirectly (Kristiawan & Zubaidah, 2020).

The palm oil industry has grown rapidly in Indonesia and has become one of the main pillars of the national economy. This commodity not only produces products with high economic value such as *crude* palm oil (CPO) and palm kernel oil (PKO), but is also the largest contributor to foreign exchange from the plantation sector (Fauzi et al., 2012). In many regions, including Aceh Province, palm oil is the backbone of the local economy and has a direct impact on people's welfare. According to a GAPKI report, Indonesia's CPO production in 2022 reached 46.73 million tons, despite a slight decline from the previous year of 46.89 million tons (Widi, 2023).

However, the growth of this industry is inseparable from various environmental issues. One of the critical issues that arise is the management of waste from palm oil processing plants. Waste, as defined by Kristiawan and Zubaidah (2020) is the residue of production that has no use or economic value, and in certain amounts and concentrations can endanger the environment and human health. In Arongan Village, Nagan Raya District, the remaining oil palm processing produces liquid waste with the characteristics of brownish sludge which creates a pungent odor and attracts insects. In addition to causing air pollution, this waste has also contaminated residents' wells and created noise from industrial activities.

Previous research shows that the impact of palm oil mill waste on the environment can be in the form of pungent odors and greatly disrupt the activities of residents and the teaching and learning process in surrounding schools (Putri et al., 2023). This emphasizes the importance of waste management that is not only oriented towards production efficiency, but must also pay attention to environmental sustainability and social comfort. To answer this challenge, the Indonesian government has implemented a palm oil industry sustainability policy through the Indonesia Sustainable Palm Oil (ISPO), as stipulated in Presidential Regulation Number 44 of 2020 (Melisa & Apriyanto, 2020). This standard requires every palm oil industry activity to pay attention to environmental principles, including waste management.

Although ISPO has been enacted, in practice the implementation of sustainable waste management has not been evenly distributed throughout the region. Many companies have not fully met the waste management standards set, either due to technological limitations, weak supervision, or lack of community participation in environmental decision making (Pardamean, 2008). Research Afrillah et al., (2015) shows that liquid waste from palm oil mills has a high COD content, and requires treatment before being discharged into water bodies. One alternative management is thermophilic anaerobic technology that can produce biogas as renewable energy (Fatimah, 2012). However, in its implementation, there are still many companies that use open ponds as waste disposal sites, such as PT Socfindo in Arongan Village.

In Arongan Village, PT Socfindo's waste storage ponds are located not far from residential areas, which has a direct impact on environmental quality and public health. Unpleasant odors, increased insect numbers, and groundwater pollution are complaints that are often expressed by residents. This is reinforced by the findings of [Yuna & Mardina \(2019\)](#) which states that high organic content in wastewater effluent can reduce the carrying capacity of the environment, kill aquatic organisms, and support the development of algae and pathogenic bacteria.

Various studies have highlighted the importance of sustainability-based waste management. [Dharmawan et al. \(2019\)](#) emphasized that ISPO certification is not just a formality, but must be the basis for every sustainable production process. While [Syafa'i \(2021\)](#) underlines that although many palm oil mills stand in the Kota Baru area, the implementation of policies to prevent environmental damage has not been maximized. Similar conditions were found in West Aceh and Nagan Raya, where the different number of mills triggered competition for the price of fresh fruit bunches, but was not matched by a uniform waste management system ([Rahmat, 2022](#)).

The geographic and demographic conditions of Arongan Village reinforce the urgency of this research. With a population of 1,116 people, the people of Arongan Village feel the direct impact of factory waste, both in the form of comfort disturbances and the potential for disease due to poor sanitation. In fact, the existence of this industry should be able to add economic value without sacrificing the surrounding environment.

Based on this description, this study aims to determine how palm oil waste management activities have been carried out properly on the environment of the Arongan Village community, Kuala Pesisir District, Nagan Raya Regency. the author refers to the theory put forward by [Anwar \(2016\)](#) which discusses the impact of development in the future by emphasizing the consequences caused by waste. These impacts are categorized into four types, namely positive impacts, negative impacts, conscious impacts, and unconscious impacts. This research is expected to fill the gap of studies that are still limited in examining the management of palm oil industry waste from a local socio-environmental perspective and become the basis for recommendations for more sustainable and equitable waste management policies for the community affected.

Methods

This research used a qualitative approach with a case study method conducted in Arongan Village, Kuala Pesisir District, Nagan Raya Regency ([Woodside & Wilson, 2003](#)). The research location was chosen because it is directly adjacent to the palm oil mill owned by PT Socfindo, a company that has been operating since 1930 and is engaged in the oil palm plantation sector. The selection of this location is based on the existence of social and environmental phenomena that are relevant and worthy of in-depth research.

The determination of informants was carried out through *purposive sampling* technique, which is a technique of deliberately selecting informants based on certain considerations in accordance with the research objectives. The informants in this study include various parties who have direct knowledge and involvement with the issue of palm oil waste management, namely the mill management, the Head of Supervision Division from the Environmental Agency, mill employees, and the local community.

The data collection techniques used include direct observation in the field, in-depth interviews with informants, and documentation as complementary data. After all the data were collected, the analysis process was carried out using interactive analysis techniques developed by Miles et al., (2014) , which includes three main stages: data reduction, data presentation, and conclusion drawing or verification.

Results and Discussion

Impact of Palm Oil Waste Management Activities on the Arongan Village Community

Palm oil waste management activities are a vital part of the industry that converts oil palm fresh fruit bunches into crude oil. The palm oil processing process generates solid waste and liquid waste. The importance of effective waste management is emphasized as illegal disposal of waste can contaminate waterways and cause environmental damage.

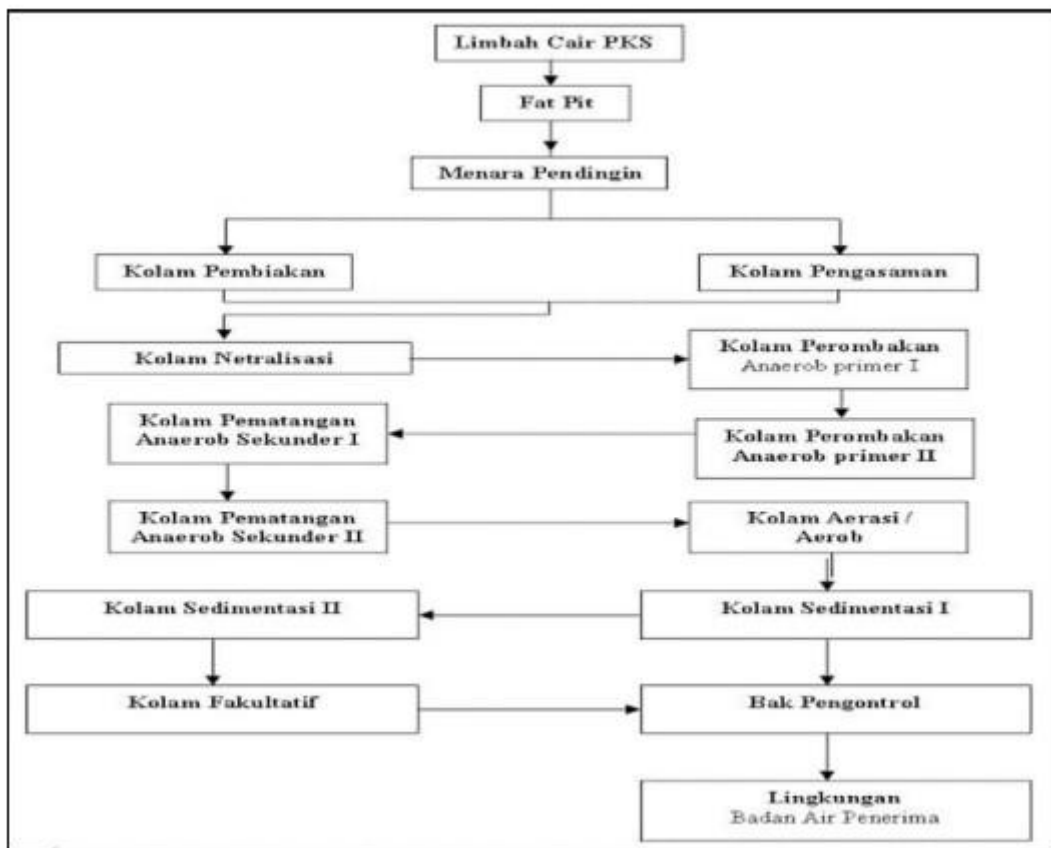
In the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 5 of 2022 regarding wastewater treatment in the mining industry using the artificial wetland method, Article 2 paragraph (1) states the obligation for the person in charge of the mining business or activity to carry out wastewater treatment before being discharged into the water medium. Article 2 paragraph (2) explains that the business or mining is responsible for the implementation of wastewater treatment technology standards through the artificial wetland method.

Indicators of Impact of Palm Oil Waste Management Activities on the Community

1. Positive Impact of Palm Oil Waste Management

Positive impacts are impacts that increase changes for the better, and provide useful developments for companies and the general public. Positive impacts are also often expected to run in line with the management process of a company in managing an item or its production. In the community environment, of course, the main thing is the development of what kind of development and what benefits from the existence of the palm oil mill, one of which is what positive impact on the surrounding community with the existence of a palm oil mill that produces waste. Besides that, it can be seen that the positive impact that can be obtained from the palm oil mill, namely, increasing local revenue (PAD), as well as expanding employment, and increasing productivity and competitiveness of work. This kind of impact is usually utilized by the factory and the surrounding community, for example, liquid waste that has hardened is used for organic fertilizer by the factory for its agricultural lands, while for the community around the factory it provides jobs as pond caretakers and so on. Here in Figure 1, several stages in order to produce raw materials with good quality:

Figure 1. Schematic of Palm Oil Mill Effluent Treatment



Source: PT Socfindo Documents

Processing palm oil waste into fertilizer basically requires several steps to obtain high-quality raw materials. However, on the other hand, the waste can also be utilized directly, provided that it is solid waste that has undergone a drying process, not liquid waste. The dried waste can be mixed with livestock manure, such as cow or goat manure, to be processed into compost. In addition, the mixture can also be added with soil from waste incineration to enrich the nutrient content of the resulting fertilizer. Here in Figure 2, waste that can be utilized:

Figure 2. Oil palm waste



Source: PT Socfindo Documents

From the results of direct research in the field, the author can conclude that the PT Socfindo palm oil mill industry has collaborated with many institutions, one of which is with Danrem 012 / TU and also with Kodim 0116 / Nagan Raya and many others. In addition to large institutions, the positive impact of PT Socfindo's palm oil waste is also utilized by the surrounding community. The majority of waste derived from the palm oil processing process, in addition to the remaining waste pollutants that have dried up, is used for plant fertilizer and can also be sold to parties outside the factory area as an economic added value. The management of palm oil waste needs to be improved, both solid and liquid waste, because it has a high potential economic value that can increase the income of palm oil processors. PT Socfindo has provided direct cash and service assistance to the Arongan Village community, and this has been implemented transparently and effectively.

2. Negative Impacts of Palm Oil Waste Management Activities

Negative impacts are impacts that are generally detrimental to the company or industry that runs a business. This kind of impact usually occurs directly and can be found if the company gets complaints from the public or other publics. This negative impact also has a very big effect in that it can bring down a business and destroy the good performance that exists in a company and even this impact can hamper the smooth running of a company to achieve its success. At the palm oil mill owned by PT Socfindo in Arongan Village there is no negative impact on the community, this can be proven by the recap of waste data for the last three months obtained from the Environmental Service. Here in Figure 3, the picture is presented:

Figure 2. Recap of PT Socfindo's Waste Laboratory

TABEL REKAPAN HASIL LAPORATORIUM LIMBAH PT SOCFINDO SEUNAGAN

NO	PARAMETRE UJI	BAKU MUTU permen lh no 5 tahun 2014	JANUARI	FEBRUARI	MARET	KET
1	PH	6-9	7,86	8,80	8,05	
2	BOD	100	89,1	83,8	98	
3	COD	150	172,81	172	206,48	
4	TSS	250	159	164	193	
5	MINYAK LEMAK	2	6,0	5,0	8,0	
6	TOTAL N	50	18,46	15,82	18,34	

MENGETAHUI,
BIDANG PENGAWASAN
EUTALIA SARDIAN, SKM
NIP.19761226 200504 2 001

Source: Environmental Agency Documents

Based on the figure above, it can be seen that the percentage of waste produced does not have a polluting impact on the environment because the PH, BOD, COD and TTS of fatty oil

produced are still low and do not exceed the quality standards.

1. PH is the degree of acidity or basicity of a solution, expressing the negative logarithm of the concentration of H ions with a base number of 10. Neutral solutions have a PH of 7, acids smaller than 7, bases greater than 7. In unpolluted waters PH is controlled by CO₂, Carbonate and Bicarbonate ions.
2. Furthermore, BOD is an approximate measurement of the amount of biochemicals that are degraded in waters. It is defined as the amount of oxygen required by aerobic micro-organism processes to oxidize into an organic material.
3. COD or Chemical Oxygen Demand is the amount of oxygen required to break down all waste materials contained in water, then,
4. Total Suspended Solid (TSS) or total suspended solids are solids suspended in water in the form of organic materials. TSS can affect turbidity and can interfere with activities in the water environment (Sutrisno and suciastuti, 2011).
5. Oils and fats are organic compounds that are usually found naturally. Both are insoluble in water, but can dissolve in non-polar organic solvents such as diethyl ether (C₂H₅OC₂H₅), chloroform (CHCl₃), benzene, and various other hydrocarbons. Their solubility in such solvents is due to the similarity in polarity between oils, fats, and non-polar organic solvents.

Based on the data obtained based on the research conducted, it shows that the waste produced by the palm oil mill owned by PT Socfindo in Arongan Village shows characteristics that are in accordance with predetermined standards. Analysis based on various parameters such as BOD, COD, TSS, pH, and N-total has shown concentrations that are in accordance with predetermined quality standards. Recognizing effluent characteristics is one of the important steps in determining an effective effluent treatment method. Field observations during one month of the waste collection/disposal ponds illustrated that the liquid waste from palm oil processing at PT Socfindo met national standards (Kep-51/MEN LH/1995), with concentrations of BOD 98 mg/L, COD 206, 48 mg/L, TSS 193 mg/L, N-total 18, 34 mg/L, and pH 8.05. The effluent treatment system is carried out through various stages, including cooling ponds, acidification ponds, breeding ponds, anaerobic ponds, settling ponds, and aeration ponds.

However, a study of PT Socfindo revealed that the effluent produced is water that is not suitable for consumption and contains various substances harmful to humans and the environment. This palm oil waste contains toxic materials in the form of dissolved and suspended solids such as colloids and oil residues with COD and BOD levels reaching 68,000 ppm and 27,000 ppm, has a high acidity level (pH 3.5 - 4), consists of about 95% water, and 4-5% dissolved and suspended materials. Therefore, the public is expected to be very careful and urged to stay away from this wastewater from palm oil.

3. Impacts Realized in Palm Oil Waste Management Activities

The impact that is realized is a real impact and is known directly by the organizers of the company or industry. This kind of impact has previously been calculated and reached by the company owner, in addition to producing an industrial product, the organizer has also reviewed the extent of the impact that will be caused. In this case, the realized impact can be felt directly by the factory and the surrounding community, as if indicating a transformation towards improvement or a negative impact on the sustainability of the surrounding environment.

Because something about impact causes a cause and effect, this kind of impact is also

anticipated by the PT Socfindo palm oil mill with careful planning, one of which is by conducting routine supervision by the Environmental Service in sampling or calculating the volume and level of compounds produced. PT Socfindo also routinely submits quarterly reports to the Environmental Service that is expected to overcome unwanted impacts that are sustainable in the future.

4. Unrecognized Impacts of Palm Oil Waste Management Activities

Unconscious impacts are impacts that arise and have caused a phenomenon so that it is only known if it has an impact on the company or factory industry. This kind of impact can be positive or negative, but in general this impact is mostly found in a negative form where this impact has harmed other parties from outside the company. Unconscious impacts are often detrimental to the company or factory because this is less evaluated so that there is no planning to prevent and deal with the problems caused by the company or industry.

One of them happened at the PT Socfindo palm oil mill where the waste storage pond is located on the side of the road where the village community and also the outside community pass by, not only that there are also many livestock roaming in the waste area which is not given a barrier so that anyone can see and can even enter there if there are no employees working. Because the waste produced is dangerous or even hot, it makes a negative impact among the community and outsiders who come.

Conclusion

Based on the results of field research, empowering palm oil waste management activities, the conclusions are: (1). There is a positive impact on the factory and the community environment, namely with data stating that the empowerment carried out is appropriate and has gone well. While in other impacts, the palm oil mill owned by PT Socfindo has routinely conducted supervision with the Environmental Service in order to overcome harmful impacts in the future. However, the utilization of waste is still not transparent and there is no open policy from the factory to the community to manage the waste, the point is that palm oil waste is currently only managed by the palm oil mill; (2). Furthermore, other impacts on the community do not have a negative impact because it has been reviewed by the factory, and the factory may have made future plans but is still in the process of field evaluation; (3). The empowerment of the workforce and the utilization of palm oil waste carried out by PT Socfindo has been very helpful to the community around the Soffindo factory, with the existence of financial assistance for (BUMG), as well as compensation for orphans and socialization of mass circumcision is very helpful to the community. The empowerment of the palm oil mill in Arongan Village has been very good and accepted by the community, besides that the palm oil mill owned by PT. Socfindo also always participates in every activity carried out by the Arongan Village community so that the activities carried out can be achieved well.

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