3rd Malikussaleh International Conference on Multidiciplinary Studies 2022 (3rd MICoMS 2022)

IINTERNATIONAL CONFERENCE PROCEEDINGS 00006 (2022) | DOI : https://doi.org/10.29103/micoms.v3i.47
E-ISSN: 2963-2536

Feasibility Analysis of Biodiesel Plant Development Model in Aceh Province

Khalsiah[1*], Rozanna Dewi[2], Yesy Afrillia[3], Gilang Ramadhan[4], Muzaffar Rigayatsyah[5]

[1] *Pendidikan Bahasa Indonesia Fakultas FKIP Universitas Malikussaleh*
[2]*Teknik Kimia Fakultas Teknik Universitas Malikussaleh*
[3]*Teknik Informatika Fakultas Teknik Universitas Malikussaleh*
[45] *Teknik Informatika Fakultas Teknik Universitas Malikussaleh*
[5] *Teknik Informatika Fakultas Teknik Universitas Malikussaleh*
[*]*Corresponding author. Email: khalsiah@unimal.ac.id*

ABSTRACT
Agricultural development that is generally carried out in rural areas is very important for a country because it has a very broad role such as producing food for the people, providing a source of income and employment for rural residents, providing a source of raw materials for the industrial sector, encouraging national and regional economic growth and preserving the environment technological developments allow agriculture to have a new role as a source of energy for life in the form of biofuels. Dependence on energy sourced from fossil fuels, especially petroleum, is getting higher and has encouraged Indonesia to develop biofuels such as biodiesel given the availability of abundant raw materials in the form of palm oil. Currently, Indonesia is the largest producer of palm oil in the world. so that the community has an alternative choice of fuel to be used and dependence on fossil fuels can be reduced and improve the economic welfare of the community, especially oil palm farmers. The study covers the aggregate area of Aceh province and commodities restricted to biodiesel derived from palm oil as the leading raw material for biodiesel in Indonesia. The feasibility level of the region (west or east) of Aceh province that has the potential for biodiesel plant development is projected through a model and economic analysis. PT Perkebunan Lembah Bhakti (Astra Agro Lestari Tbk) in Aceh Singkil regency, Aceh province built 1,000 hectares of plasma oil palm plantations in an effort to increase the productivity of the company's management and improve the economy of the local community. PT Ika Bina Agro Wisesa in the Guha Uleu area, Kuta Makmur District, North Aceh Regency accommodates around 700 tons of palm oil owned by local farmers.

Keywords: *Biodiesel, Biofuels, Palm Oil, Palm Oil Bunch*

1. INTRODUCTION

The need for primary energy fuel continues to increase in line with population growth and technological advances. Fuel consumption nationally continues to increase from year to year. Every day the average national fuel consumption reached 140,000-180,000 kiloliters. The increasing need for energy causes the exploitation and consumption of energy from petroleum is getting higher the more depleted petroleum reserves [1].

One solution to overcome this problem is to look for renewable energy sources that can be produced continuously and sustainably. Seeing these conditions the government has given serious attention to the development of biofuels (referred to as biofuels, consisting of biodiesel, bioethanol and pure plant oil) by issuing Presidential Instruction No. 1 of 2006 on January 26, 2006 on the supply and utilization of biofuels as alternative fuels. Biofuel (BBN) or biofuel is an agricultural commodity-based transportation fuel that is usually used for foodstuffs. BNN's popular commercial products are bioethanol and biodiesel.

Biodiesel is one of the promising alternative fuels, is environmentally friendly, has no effect on health and can be used as a motor vehicle fuel that can reduce emissions when compared with diesel oil. Biodiesel can be used pure or mixed, and is specifically for diesel engines. Biodiesel is used to reduce diesel consumption. Biodiesel, generally made through a chemical process called a transesterification reaction or esterification, which is a reaction of ester and alcohol compounds using a catalyst. Biodiesel is made from vegetable oils derived from renewable natural resources. Raw materials that have the potential as raw materials for biodiesel makers include: palm oil, soybeans, sunflowers, Jatropha, sugar cane, avocado and several other plant species. In addition to vegetable oils, raw materials can also be from animal fat, bakas fat or recycled fat. All of these raw materials contain triglycerides, free fatty acids (ALB), and pollutants [1]. Biodiesel is chemically included in the mono

alkyl ester or methyl ester group with a carbon chain length between 12-20. This distinguishes it from petroleum diesel (diesel) whose main component is hydrocarbons.

Vegetable oil is a potential raw material as a source of biodiesel because of its renewable existence. Vegetable oil used should be with low levels of free fatty acids (ALB) (<1%), if more, it is necessary to pretreatment because it will result in low efficiency performance. Examples of vegetable oils used in biodiesel production are coconut oil, palm oil, and castor oil. Of the three basic ingredients, palm oil produces the highest vegetable oil, which is 5,950 liters/ha/ year, while coconut 2,689 liters/ ha/ year, and castor bean 1,892 liters/ ha / year. The total area of oil palm plantations in Aceh is 237,769 Ha (Aceh in BPS, 2020) spread across several districts such as Nagan Raya, East Aceh, Aceh Tamiang, North Aceh, West Aceh, Southwest Aceh, etc. Total production of 440,087 tons, with the number of farmers 137,063 people.

The development and utilization of biodiesel in Indonesia is still constrained by the price of raw materials that are still expensive which causes the selling price of biodiesel to be high so that it cannot compete with subsidized fuel prices. Based on the above, it is necessary to study the development strategy of the biodiesel industry in Aceh province. This strategy study is needed to assist decision makers in choosing the right strategy so that the biodiesel industry can develop in Aceh province. In this study, a model will be developed to measure the feasibility of establishing a biodiesel plant in Aceh province based on the potential and market demand and feasibility from an economic perspective. So for the future, the community has an alternative choice of fuel to be used and dependence on fossil fuels can be reduced and improve the economic welfare of the community, especially oil palm farmers.

1.1. *Biodiesel*

Biodiesel is a liquid fuel produced from vegetable oil and can be used as an alternative to diesel or diesel. According to Nelson et al. (1996) and Watanabe et al. (2001), generally biodiesel is produced through the process of transesterification, which is a chemical reaction between vegetable oils and alcohols with the help of catalysts to produce esters (biodiesel) and glycerol. The catalyst used is usually a catalyst base, acid or enzyme [2, 3]. According to Zhang et al. (2003), methanol is commonly used because it is cheaper and therefore has lower production costs [4]. The advantages of biodiesel cause biodiesel to be the best alternative to fossil fuels and has been used in various countries, especially countries that are sensitive to environmental issues [4]. Transesterification reaction takes place at low temperatures of 60-70 ^{o}C, pressure 20 psia, with yields ranging from 95-98 percent.

Diesel/diesel that can not be renewed and is not environmentally friendly due to the content of CO, CO_2 and relatively high berafiya metals, biodiesel is renewable energy and environmentally friendly. The energy produced by biodiesel is relatively similar to that produced by diesel. The use of biodiesel can minimize the greenhouse effect because CO_2 gas produced from the combustion of biodiesel can be recycled through the process of photosynthesis, CO emissions and the content of particulate matter and unburned hydrocarbons is low, the flame point is relatively high, and is able to provide a lubricating effect [5].

The type of oil used as raw material for biodiesel in a country depends on the potential of raw materials available in the country concerned. Some types of oils used as raw materials for biodiesel are soybean oil, canola oil, sunflower seed oil, castor oil, coconut oil, and palm oil. Several factors into consideration for a producing country to develop biodiesel are: a) the availability of raw materials in the country, b) vegetable oil to be processed into biodiesel is a native plant or native cultivation of the country so that the supply of raw materials is guaranteed, c) production capacity adjusted to the demand for biodiesel products in the country, and d) awareness of the scarcity of energy resources in the future [6]. Important parameters of biodiesel are cetane number, Acid Number and iod number [6].

The development of biodiesel by utilizing the potential of vegetable oil raw materials in Indonesia is a solution to overcome people's dependence on fossil fuels, especially considering that Indonesia is currently a net importer country due to greater needs than the ability to produce. The purpose of this study is to analyze the actual condition of palm oil production available in Aceh province as a raw material for vegetable oil to produce biodiesel, mapping the prospects for the development of biodiesel as an alternative bioenergy in Aceh in terms of alternative energy needs, projecting market needs and feasibility studies on opportunities for the development of biodiesel plants in, create a suitable biodiesel plant development model established in Aceh province and provide recommendations on biodiesel plant development strategies in Aceh province.

1.2. METHODS

An appropriate biodiesel industry development strategy is needed as a solution, with the aim that the biodiesel industry is growing in Indonesia, so that the dependence of the Indonesian people on fossil fuels is lower as shown by the increase in biodiesel consumption by the community. The problem of this study is a complex phenomenon because it involves a variety of interrelated factors, so it takes a system approach to solve the problem. The development of biodiesel from palm oil has an impact on the increase in palm oil prices. The increase in palm oil prices led to palm oil production also increasing. The increase in palm oil prices and palm oil production has an impact on the increase in the price of fresh fruit bunches of oil palm. The increase in the price of fresh fruit bunches of oil palm provides incentives to farmers and large plantations to expand the area of oil palm plantations owned. Expansion of oil palm plantation area can increase the production of fresh fruit bunches of oil palm.

This study uses secondary data in the form of national and provincial Aceh time series data from 2010-2021. The Data is sourced from the Central Statistics Agency, Ministry of Agriculture, Bank Indonesia, Ministry of energy and Mineral Resources and from various other relevant agencies and associations. The secondary time series Data above is used to build the appropriate econometric model and perform parameter estimation based on the model that has been built.

3. RESULTS AND DISCUSSION

Location for this study is the West Region of Aceh includes: Aceh Singkil and Meulaboh, and the Eastern Region of Aceh includes: North Aceh, East Aceh, Langsa, Kuala Simpang). This research activity was carried out in June – December 2022. The benefit of this research study is that the community has an alternative choice of fuel to be used and dependence on fossil fuels can be reduced and improve the economic welfare of the community, especially oil palm farmers. The study covers the aggregate area of Aceh province and commodities restricted to biodiesel derived from palm oil as the leading raw material for biodiesel in Indonesia. The feasibility level of the region (west or east) of Aceh province that has the potential for biodiesel plant development is projected through a model and economic analysis.

Figure 1. PT Bulgak Palma Sejarah

In 2021, oil palm production was 795,035 tons (people's oil palm 456,426 tons, palm oil large plantations 338,608.77 tons), overall average productivity of 2,745 Kg/Ha per year in the form of Crude Palm Oil (CPO) (Aceh Plantation Statistics 2021 FY 2022). In the last 5 (five) years CPO production continues to increase. In general, oil palm productivity in Aceh is far from declining. National oil palm productivity is now 3.3 to 3.5 tons per hectare in a year. Aceh is still far from the National Productivity of only producing 2.2 tons per hectare in a year. In other words, Aceh only has one million tons of CPO per year. With the people's oil palm rejuvenation program initiated by the Indonesian government, it can encourage and increase productivity. All CPO in Aceh flows to Belawan or Tanjungpura, North Sumatra. Only a small part of CPO flowed through ports in Aceh last year. Namely, the port of Calang and Lhokseumawe. Sapri deeply regretted that CPO income in Aceh continues to decline. In fact, Aceh has the best oil palm plantations, namely Socfindo in Nagan Raya.

PT Perkebunan Lembah Bhakti (Astra Agro Lestari Tbk) in Aceh Singkil regency, Aceh province built 1,000 hectares of plasma oil palm plantations in an effort to increase the productivity of the company's management and improve the economy of the local community. Public relations of PT PLB Hadi Sukoco said the company's management is currently focusing on the development of plasma plantations because there is no more land that can be developed for the company's plantations. Terlebih again in its activities the majority of Aceh Singkil people are oil palm farmers and fishermen were always constrained in getting superior seeds and fertilizers for the maintenance of oil palm itself so it is quite appropriate if farmers have it. Building a plasma plantation in addition to the responsibility of the company is also the mandate of the law that must be implemented. Every company is required to provide 20 percent of the total area of plasma plantation PT PLB in Aceh Singkil reaching 6,000 hectares. Furthermore, it is said that the great expectations of the community who received guidance from the company's management were to be able to produce 25 tons/hectare equivalent to the company's production so that the community's income increased. In addition to the market opportunities for oil palm shelter in Aceh Singkil is very large, in the region many companies are willing to accommodate farmers ' production in accordance with the latest price standards Palm Fruit Bunch.

The palm oil mill owned by PT Ika Bina Agro Wisesa in the Guha Uleu area, Kuta Makmur District, North Aceh Regency accommodates around 700 tons of Palm Fruit Bunch owned by local farmers. PT Ika Bina Agro Wisesa does not have its own garden. PT Ika Bina Agro Wisesa partners with oil palm farmers and accommodates Palm Fruit Bunch every day reaching 700 tons. PT Ika Bina Agro Wisesa's palm oil mill began operations in February 2019. The plant has a production capacity of 30 tons per hour. With this capacity, the factory is able to absorb Palm Fruit Bunch farmers in North Aceh ranging from 17 thousand to 21 thousand tons of Palm Fruit Bunch per month or an average of 700 tons per day. PT Ika Bina Agro Wisesa hopes that the existence of palm oil mill will provide great benefits for the community in improving the economy and reducing unemployment. Head of the Department of Plantation, livestock and animal health of North Aceh Regency Lilis Indriansyah said the current price of Palm Fruit Bunch at the palm oil mill or factory ranges from Rp 2,990 to Rp 3,110 per kilogram. While the price at the Collector level Rp 2. 800 per kilogram. Palm Fruit Bunch prices continue to rise. The price increase is due to high demand for crude oil or CPO. For CPO prices currently reach USD 14 thousand per kilogram. North Aceh Regency has an area of oil palm plantations reaching 18 thousand hectares. With this area, during the harvest season, the Palm Fruit Bunch owned by local farmers still can not be accommodated by a number of palm oil mill in the area.

PT Perkebunan Nusantara I currently manages six oil palm plantations and three palm oil processing plants spread across three districts (Aceh Tamiang, East Aceh and North Aceh) and one city district (Langsa City) in Aceh province, namely: Pulau Tiga Plantation is one of the agribusiness business units of PT Perkebunan Nusantara I which has a 5,561 ha HGU. Divided into 8 Afdeling expanse region Tamiang Aceh district (district vocational Young, District Tamiang Hulu, District Bandar Pusaka) with a height of 10-125 meters above sea level.

Tualang Sawit plantation is 35 Km from the Head Office of PT Perkebunan Nusantara I, located in Blang Tualang Village, Birem Bayeun District, East Aceh Regency. Tualang Sawit plantation is one of the working units of PT Perkebunan Nusantara I which was built in 1990 as a form of management commitment of PT Perkebunan Nusantara I and the Aceh Regional Government in order to develop plantation crops. Commodities in the business are oil palm plants from the Year of planting 1991 until the Year of planting 2016 covering an area of 2,044 Ha, TBM-I covering an area of 585 Ha, TBM-II covering an area of 558 Ha and TBM-III covering an area of 36 Ha. The existence of several investors who build palm oil mills in North Aceh is very helpful to local farmers, so farmers can sell at a high price because it does not require large costs to be sold to other regions. The establishment of a palm oil mill in North Aceh is a solution in the absorption of Palm Fruit Bunch. Palm oil mills can help accelerate the economic development of the region which in turn can improve the welfare of the community. In North Aceh Regency, the price of Palm Fruit Bunch at PT Ika Bina Argo Wisesa (IBAW) located in the village of Guha Uleu, Kuta District Makmur, Rp 3.010/kg. While in PT SAP and Pt Satya Agung respectively Rp 2,850/kg and Rp 3,040/kg.

Cot Girek Palm Plantation is one of 3 mills owned by PT Perkebunan Nusantara I, located in Cot Girek Village, cot Girek District, North Aceh Regency, Aceh province, about 385 KM north of Banda Aceh city. Cot Girek oil palm plantation was built in 1991 with a capacity of 30 tons/hour and the capacity was increased to 45 tons/hour where the source of FFB comes from the garden itself and the surrounding community. The condition of cot girek garden area in general has topografii with the following percentage: flat (0-3 degrees slope) = 4.879 Ha (65%) wavy/wavy (4-15 degrees slope) = 2, 252 Ha (30%). Hilly rather mountainous (>40 degrees slope) = 375.36 Ha (5%). (Source: Annual Report 2021 – PT Perkebunan Nusantara I) [7].

PT Aceh Trumon Anugrah Kita (ATAK) was established in 2022 and is located in Tapaktuan, South Aceh and has a 17 Ha factory area with a capacity of 45 tons/hour. The presence of PT Aceh Trumon Anugerah Kita palm

oil mill industry will have a positive impact on the economic growth of the people of South Aceh in general and East Trumon District in particular and also have a significant impact on improving the economic level of the community, opening jobs, increasing local revenue and marketing harvest Palm Fruit Bunch community in South Aceh district continues to increase. The price of Palm Fruit Bunch currently in South Aceh Regency is still varied, ranging from Rp 1,600 to Rp 2,200 per kilogram (kg). This was conveyed by one of the oil palm farmers in Kampong Cot Bayu, Central Trumon District. Palm Fruit Bunch prices had skyrocketed to Rp 3,200 per kg, and had slumped Rp 1,300 per kg. He continued, currently the highest purchase price at the Crude Palm Oil (CPO) factory of PT Aceh Trumon Anugerah Kita (ATAK) Kampung Kapa Kesekat, East Trumon. Oil palm production owned by Kampong Cot Bayu reached hundreds of tons per day. The crops were sold each to various Rams in the region, including to a nearby CPO plant.

PT Satya Agung is located at Uram Jl., District. Geureudong Pase, North Aceh Regency. PT Satya Agung implemented a zero waste system. Palm Oil Mill in PT Satya Agung has a processing capacity of 30 tons/hour the 45 tons / hour extension has started operating since May 2021. Source Palm Fruit Bunch for Palm Oil Mill in PT. Satya Agung comes from the surrounding community gardens and gardens of PT. Satya Agung itself with a land area of approximately 10,000 Ha. PT Satya Agung in operation has implemented zero waste or zero waste by utilizing all waste generated from the processing of Palm Fruit Bunch into CPO. The waste includes solid waste and liquid waste. Solid waste, in the form of Empty Fruit Bunch (EFB) and shell while liquid waste in the form of Palm Oil Mill Effluent (POME). The waste is used to increase the fertility of oil palm and fuel. PMKS Satya Agung can improve the economy of the surrounding community by absorbing labor from villages around the factory, receiving Palm Fruit Bunch from the surrounding community Geurodong Pase District and Simpang Keuramat District.

PT Satya Agung was inaugurated in 2022, during the inauguration, it was also handed over a plasma certificate for oil palm plantations owned by the community around PT Satya Agung by the Minister of ATR / BPN Hadi Tjahjanto. The community has been incorporated in two farmer cooperatives that have incorporated the cooperative property Bumoe Mbang and cooperative Mentari. The total number of farmers who are members of the two cooperatives amounted to 1,000 people with a total area of about 2,000 Ha. Its members range from ordinary people to former combatants of the Gerakan Aceh Merdeka (GAM). The Model applied in the partnership of PT Satya Agung and farmers is a plasma system. It is expected that with this partnership the welfare of the surrounding community will increase and the company's profits will also increase because the results of farmers' Palm Fruit Bunch will be sold to PT Satya Agung.

PT Bumi Tamiang Sentosa (BTS) is located in Tebing Tinggi Village, Tenggulun District, Aceh Tamiang and was inaugurated on September 15, 2022. PT Bumi Tamiang Sentosa has a large-scale capacity of up to 45 tons per hour and has a local workforce, especially upstream communities. The availability of oil palm plantations in Aceh Tamiang is very wide, but the number of factories is still limited. The establishment of this new pal oil mill is expected to be able to process production other than their own plantations and also community oil palm to obtain more efficient oil and nuclei, because Palm Fruit Bunch no longer need to be sold outside Aceh Tamiang. This year, two new palm oil mill units have been built in Aceh Tamiang with a capacity of 30 tons and 45 tons per hour. So now there are 13 units of PKS in Aceh Tamiang. We know the demand for Crude Palm Oil (CPO) continues to increase from year to year so that many palm oil mills are needed. PT BTS Manager Ngari Ika Ono through a press statement said the factory will operate to process Palm Fruit Bunch with a production capacity of 30-45 tons per hour. It is expected to absorb dozens of employees by prioritizing local labor. With the operation of this factory, it is expected that the economy can grow quickly. We are also committed to channeling social investment from CSR funds for the economic empowerment of the community around the company.

Table 1. Acreage and production of oil palm commodities Aceh smallholders estate by District/City fixed figures from districts/cities in 2021.

No.	Kabupaten/ Kota	Luas Areal (Ha)			Jumlah (Ha)	Produksi (Ton)	Rata-Rata Produktivitas (Kg/Ha)	Jumlah Petani (KK)	Ket.
		TBM	TM	TR					
1	2	3	4	5	6	7	8	9	10
1.	Simeulue	1.291	1.211	1.232	3.734	1.112	918	3.196	Wujud Produksi
2.	Aceh Singkil	6.537	22.961	2.965	32.463	79.354	3.456	10.968	CPO
3.	Aceh Selatan	1.372	9.996	178	11.546	26.178	2.619	8.938	
4.	Aceh Tenggara	600	1.848	210	2.658	4.990	2.700	1.340	
5.	Aceh Timur	11.194	13.975	3.283	28.453	32.953	2.358	17.343	
6.	Aceh Tengah	-	-	-	-	-	-	-	
7.	Aceh Barat	5.586	4.756	523	10.865	16.722	3.516	8.663	
8.	Aceh Besar	504	821	74	1.399	498	607	715	
9.	Pidie	17	46	47	110	38	816	69	
10.	Bireuen	1.949	1.985	192	4.126	4.079	2.055	3.012	
11.	Aceh Utara	1.529	15.630	1.026	18.185	61.223	3.917	10.794	
12.	Aceh Barat Daya	2.103	17.214	536	19.853	28.969	1.683	10.392	
13.	Gayo Lues	-	-	-	-	-	-	-	
14.	Aceh Tamiang	3.973	18.495	637	23.105	46.607	2.520	10.625	
15.	Nagan Raya	8.256	37.145	6.827	52.228	98.620	2.655	26.534	
16.	Aceh Jaya	5.041	8.147	2.992	16.180	23.237	2.852	11.379	
17.	Bener Meriah	575	333	392	1.300	375	1.126	1.040	
18.	Pidie Jaya	578	370	11	958	883	2.389	1.430	
19.	Banda Aceh	-	-	-	-	-	-	-	
20.	Sabang	-	-	-	-	-	-	-	
21.	Langsa	58	538	121	716	1.164	2.166	788	
22.	Lhokseumawe	89	121	-	209	305	2.531	130	
23.	Subulussalam	8.111	10.689	214	19.014	29.120	2.724	13.302	
	ACEH	59.363	166.279	21.459	247.102	456.426	2.745	140.658	
	2020	63.023	162.159	17.638	242.819	444.436	2.741	139.153	
	2019	61.460	161.629	17.277	240.365	441.803	2.732	138.305	
	2018	60.508	158.291	18.969	237.769	440.087	2.780	137.063	
	2017	60.159	155.553	18.768	234.479	437.292	2.811	129.021	
	2016	62.983	142.219	23.028	228.230	399.618	2.810	124.362	
	2015	67.184	134.564	18.344	220.092	385.175	2.862	119.890	
	2014	66.437	131.209	17.204	214.850	375.826	2.864	116.067	
	2013	58.758	123.462	16.026	198.246	345.893	2.802	115.242	
	2012	63.395	118.681	12.563	194.639	310.766	2.618	115.242	
	2011	62.499	109.989	10.880	183.368	220.236	2.002	102.414	
	2010	62.000	101.107	10.110	173.217	144.918	1.433	93.017	
	2009	44.597	84.077	11.767	140.441	181.633	2.160	85.162	
	2008	30.770	70.372	12.592	113.734	120.689	1.715	69.924	
	2007	25.133	58.826	12.556	96.515	112.075	1.905	60.093	
	2006	20.258	58.520	10.421	89.199	106.146	1.814	55.050	

Sources: Aceh Agriculture and Plantation 2021

Table 2. Planting area and oil palm production in Aceh 2014-2016

District/City with total	Oil palm planting and production area					
	Area (Ha)			Production (Ton)		
	2014	2015	2016	2014	2015	2016
Subulussalam	16 796,00	16 796,00	18 377,00	31 850,00	31 850,00	33 314,00
Simeulue	3 813,00	3 813,00	3 813,00	1 741,00	1 741,00	1 750,00
Sabang	-	-	-	-	-	-
Pidie Jaya	736,00	736,00	746,00	719,00	719,00	763,00
Pidie	84,00	84,00	99,00	31,00	31,00	31,00
Nagan Raya	40 216,00	40 216,00	49 399,00	74 905,00	74 905,00	108 929,00
Lhokseumawe	208,00	208,00	210,00	243,00	243,00	244,00
Langsa	410,00	410,00	409,00	865,00	865,00	865,00
Jumlah	214 850,00	214 850,00	228 230,00	375 826,00	375 826,00	399 618,00

District/City with total	Oil palm planting and production area					
	Area (Ha)			Production (Ton)		
	2014	2015	2016	2014	2015	2016
Gayo Lues	-	-	-	-	-	-
Bireuen	3 224,00	3 224,00	3 751,00	1 799,00	1 799,00	2 249,00
Bener Meriah	1 300,00	1 300,00	1 300,00	100,00	100,00	100,00
Banda Aceh	-	-	-	-	-	-
Aceh Utara	17 251,00	17 251,00	17 911,00	39 348,00	39 348,00	39 643,00
Aceh Timur	25 298,00	25 298,00	25 842,00	28 344,00	28 344,00	28 909,00
AcehTenggara	6 739,00	6 739,00	2 406,00	17 186,00	17 186,00	4 490,00
Aceh Tengah	-	-	-	-	-	-
Aceh Tamiang	20 347,00	20 347,00	20 902,00	44 380,00	44 380,00	39 573,00
Aceh Singkil	30 710,00	30 710,00	31 351,00	74 503,00	74 503,00	74 885,00
Aceh Selatan	7 975,00	7 975,00	9 270,00	12 801,00	12 801,00	15 325,00
Aceh Jaya	13 544,00	13 544,00	14 458,00	16 548,00	16 548,00	17 188,00
Aceh Besar	1 607,00	1 607,00	1 664,00	690,00	690,00	680,00
Aceh Barat Daya	17 100,00	17 100,00	17 314,00	14 203,00	14 203,00	14 260,00
Aceh Barat	7 492,00	7 492,00	9 008,00	15 570,00	15 570,00	16 420,00
-						
Sources : Aceh Dalam Angka 2015						

Factors that determine and must be considered in the plan to establish a biodiesel plant in Aceh:

1. Distribution

Distribution is a marketing activity aimed at creating added value to products through the marketing function by distributing, distributing, delivering or delivering goods and services from producers to consumers, which are used as needed (type, quantity, price, place and time). This process facilitates the flow of marketing (marketing channel flow) physically and non-physically. A distribution channel or marketing channel is a series of interdependent organizations involved in the process of making a product or service ready for use or consumption for distribution.

Distribution channels when viewed from afar in short the distribution chain, can be grouped into two (Kotler, 2005: 561):

a. Direct distribution channels, namely distribution channels where products from producers directly into the hands of consumers without going through intermediaries or distributors.

b. Indirect distribution channels, namely the company distributing its products using dealers/intermediary agents and retailers before it gets into the hands of consumers.

2. Marketing

a. Advertising, i.e. all forms of non-personal presentation and promotion of ideas, goods or services by an appointed sponsor for a fee.

b. Sales promotion, which is a long-term incentive to encourage the desire to try or buy a product or service.

c. Direct marketing through the use of mail, telephone, and other non-personal liaison tools to communicate with or elicit responses from specific customers and prospects.

d. Personal selling is the direct interaction between one or more prospective buyers for the purpose of making a purchase.

Public relations and publicity through various programs designed to promote and or protect the image of the company or its individual products.

2. Lingkungan

The macroenvironment is a broader societal force that affects the entire microenvironment.

3. Demography

According to Kotler and Armstrong, (2004: 107) demography is about the human population in terms of number, density, location, age, sex, race, type of work, and other statistical figures. The demographic environment is very concerned by marketers because it involves humans, and humans are the ones who form the market. Various symptoms that occur in this demographic aspect can be used by marketers to be the basis for making marketing strategies and programs.

4. Technology

Understanding of technology, both on consumer behavior, and on business processes run by the company is very decisive.

5. Politics and Law

Political conditions can have an influence even though they are often not so real, in other words, if the atmosphere of state management is not turbulent, companies can market their products safely. Legal forms, legislation, to other government agencies/agencies that affect the smooth running of the organization are aspects that marketers pay attention to because they will more or less exert an influence on marketing activities. The political environment consists of legislation, governing bodies, and influential groups that affect and limit various organizations and individuals in a particular society (Kotler and Armstrong, 2004:123).

6. Culture Social

Culture, as written in the book Fundamentals of Marketing (Kotler and Armstrong, 2004: 127) is an institution and a force that affects people's basic values, perceptions, preferences, and behaviors. Therefore the influence exerted on the company as a marketer is very strong and broad. In principle, there are two cultural values of concern, namely core values (core values), and secondary values. Core values do not suffer too much.

7. Society

An organization not only pays attention to its competitors in an effort to satisfy its target market, but also pays attention to a large number of general layers of society that pay attention. Whether they accept the methods of the company in conducting its business or not. The marketing environment of the company also includes various groups of people. Society is a group that has an actual and potential interest in or impact on the organization's ability to achieve its goals (Kotler and Armstrong, 2004:105).Its management aspects: examines aspects of management and organization, marketing competence, finance, production and human resources. Each factor is assessed whether it is a major strength, a side strength, a neutral factor, a side weakness or a weakness.

AUTHORS' CONTRIBUTIONS

All authors conducted the contribution to this experiment. Rozanna Dewi conducted the experiments and analyzed the data. Khalsiah also contributed to the experiment process and assisting to draw the tables and graphics. Yesy Afrillia involved in data analysis and writing the paper. All authors contributed to manuscript revisions and all authors agreed to the final version of this manuscript.

ACKNOWLEDGMENTS

This research is funded by Dana Proyek Advanced Knowledge and Skills for Sustainable Growth Project in Indonesia - Asian Development Bank (AKSI-ADB) Universitas Malikussaleh Tahun 2022. This research was done in a 6 months period.

REFERENCES

[1] Liza Devita, 2015, Biodiesel Sebagai Bioenergi Alternatif dan Prospeftif, Jurnal Agrica Ekstensia, Vol, 9, No, 2 Nopember 2015, 23-26.

[2] Nelson, L.A., Foglia, T.A., Marmer, W.N., Lipase-Catalyzed Production Of Biodiesel. J. Am. Oil Soc. Chem, 1996,73 (8) : 1191- 1195.

[3] Watanabe, Y, Shimada, Y, Sugihara, A., Tominaga, Y, Enzymatic Conversion Of Waste Edible Oil To Biodiesel Fuel In A Fixedbed Bioreactor, J. Am. Oil Soc. Chem, 2001, 78 (2), 703- 707.

[4] Zhang, Y, M.A. Dube, D.D. McLean, M. Kates, Biodiesel Production From Waste Cooking Oil, Process design and techno logical assessment. Bioresource Technology, 2001, 89: 1- 16.

[5] Korbitz, W., Biodiesel production in Europe and North American, an encouraging prospect. Renew. Energy 16 : 1078-1083. Krawczyk, T., 1996, Biodiesel, INFORM 7 (8) : 801-822.

[6] Soerawidjaja, T.H. dan Tahar A, Menggagas Kebijakan Pengembangan Biodiesel di Indonesia. Seminar Peluang Bisnis, 17 Desember 2003, Serpong.

[7] Annual Report Annual Report, PT Perkebunan Nusantara I, 2021, Builds Managerial Competence Optimally For The Growth And Development Of The Company.