Chapter 2

Biofuel Promotion Policies and Development Status in East Asian Countries

November 2014

This chapter should be cited as
ERIA (2014), 'Biofuel Promotion Policies and Development status in East Asian Countries', in Yamaguchi, K. (ed.), *Study on Asian Potential of Biofuel Market*. ERIA Research Project Report 2013-20, pp.7-21. Available at: http:/www.eria.org/RPR_FY2013_No.20_Chapter_2.pdf

CHAPTER 2
Biofuel Promotion Policies and Development Status in East Asian Countries

Biofuel Policies and Programs

(1) Existing Policies and Regulations

The policies implemented for biofuels in the East Asian region (ASEAN+6) differ among the countries depending on their purposes. Although they share most of the policy drivers in promoting biofuels, their priorities are different. Table 2.1 presents a summary of the current biofuel-related policies in each country. The Philippines and Indonesia are implementing mandatory policies to introduce both bioethanol and biodiesel. Australia has also implemented the mandatory introduction of biofuel policy at the state level. South Korea has also mandated the introduction of biodiesel by B2. Most of the member countries' biofuel promotion policies, however, are based on the development program rather than on the mandatory scheme. For Japan, promotion is limited to the introduction of 500,000 kilolitres (kL) of ETBE[1]-based biofuel (E3) as a voluntary effort by the private sector. The policies to introduce biofuels in the region have the following features, as discussed below.

Rural Development

Most of the developing countries in this region are promoting biofuels as a part of the rural development policy. The development of biofuels is expected to improve the energy supply system and poverty problem in rural area. Especially in Indonesia, the Philippines, and Thailand, biofuel policies are adopted to increase the income of farmers and to provide energy resources to rural areas through local production. The promotion of biofuels in the

[1] Ethyl tertiary butyl ethel (ETBE) is a chemical compound of ethanol.

Philippines and Indonesia has significant effects because of the transport barriers when accessing the commercial energy source.

Energy Security

In this region, except for Malaysia and Brunei Darussalam, all member countries are net oil importers. The fluctuation of international oil price always becomes an uncertain factor for these countries. Particularly for the Southeast Asian countries, increasing oil prices will squeeze their national budgets because of their subsidies to fossil fuel and electricity. For example, Indonesia has caused a financial crisis in 2005 because of the remarkable increase of international oil prices. Hence, biofuels as a domestic resource are expected to be a substitute of imported oil. The effort to reduce the dependence on imported oil is the most important energy strategy to keep the stability of energy supply in this region.

Industry Strategy

Malaysia and Singapore are promoting biofuels as part of their industrial policies. To enhance the promotion of biofuels as an export industry, the Malaysian government has maintained the related industry regulations. The processes are widespread to upstream palm oil production, refinery, trade regulation, taxation, and fuel standards. On the other hand, Singapore has a strategy to promote biofuels in order to become a hub of the refinery industry in the region by fully utilising the existing infrastructure for oil refinery. The government is promoting a plan to become a trading centre of biofuels in the region.

Environment Policy

Developed countries in this region have promoted biofuel policies as environmental policies to mitigate the impact of global warming and air pollution. Biofuel initiatives of Japan and South Korea are motivated to reduce greenhouse gas emission. In some cities in China and India, biofuels are promoted as a countermeasure against air pollution.

Features of biofuel promotion policies introduced in this region:

- Priorities and motivations in each country are greatly different.

- There are no common regional policies with clear criteria, such as those for trade, environmental protection, or food security.

Table 2.1 Main Drivers for Biofuel Promotion by Country

Country	Main Drivers		Country	Main Drivers
Australia	>CO_2 reduction >Clean energy supply		Malaysia	>Industry development
Brunei Darussalam	No		Myanmar	>Energy security >Agriculture development policy
Cambodia	>Reduce oil import >Explore clean fuels		New Zealand	>CO_2 reduction >Clean energy supply
China	>Reduce oil consumption >Food stock adjustment		Philippines	>Reduce oil import >Energy security >Rural development
India	>Reduce oil import >Explore clean fuels		South Korea	>Energy diversification >Reduce oil import >Clean energy supply
Indonesia	>Reduce oil import >Energy security >Rural development		Singapore	> Industry development
Japan	>CO_2 reduction >Clean energy supply		Thailand	>Reduce oil import >Energy security >Rural development
Lao PDR	>Energy security		Viet Nam	>Reduce oil import >Energy security

Table 2.2 Policy and Target for Biofuel Development by Country

Country	Mandatory	Main Policy, Development Program, and Planning	Target
Australia	Local level: E4, B2	1. The Fuel Quantity Standards Act 2000 2. The Ethanol Production Grants Program (2002–2021) 3. The Energy Grants Scheme (2011–2021) 4. The Ethanol Distribution Program (Finished)	20% of total transport fuels in 2050 (including bio-jetfuel)
Brunei Darussalam	No	No	No
Cambodia	No	No	No
China	No	1. Act for Testing Expansion of Ethanol-Blended Gasoline for Cars (2004), 6 provinces and 27 cities (E10) 2. 500 yuan (6 cents)/liter [(a)] for bioethanol production (2011–2012) 3. RE Development in the 12th Five-Year Plan	Bioethanol: 4 million tonnes (2015) Biodiesel: 1 million tonnes (2015)
India	No	1. National Policy on Biofuels > 9 states and 4 union territories, E5	Biofuel: 20% by 2017
Indonesia	B10 (2013), E3	1. National Energy Policy (2006) 2. Presidential Instruction No. 1/2006 3. Mandatory Regulation DEMR No. 32/2008	5% of national energy mix by 2025
Japan	No	1. Voluntary target of 500,000 kilolitres (kL) of bioethanol by E3 (ETBE)	Total 500,000 kL bioethanol by 2017
Lao PDR	No	1. Renewable Energy Development Strategy (2010)	10% of total transport fuels in 2020 Bioethanol: 106 million litres Biodiesel: 205 million litres
Malaysia	No	1. National Biofuel Policy (2006) 2. B5 promotion Program (Started June 2011, completed July 2014)	B7 after July 2014
Myanmar	No	1. Jatropha tree-planting project, 2006–2008	4 million hectares (ha) by 2015
New Zealand	No	1. Biofuel Act 2008, Obligation B5 and E3~E10 2. Biofuel Sales Obligation (Apr. 2008 ~ Dec. 2012): 3.4% of transport fuels. Excise tax of NZ$ 0.505 cents/liter is exempted. (Abolished). 3. Biodiesel Grants Scheme (Jul. 2009 ~ Jun. 2012): Subsidy NZ$ 0.425 cents/liter (Removed)	No target
Philippines	E10, B2	1. Biofuel Act 2006 (RA 9367) 2. National Biofuel Program	2030: E20/E80, B20
South Korea	B2	1. 2nd Biodiesel Long-term Supply Plan (2010) - (1st plan: 2006)	B5: vehicle B20: bus and truck
Singapore	No	1. Industry strategy on worldwide biofuel terminal and as a hub for biofuel trade	No target

Thailand	No	1. Alternative Energy Development Plan (AEDP: 2013–2021) 2. Incentive to palm oil growing area of 2.5 million *rais* 3. Price subsidy to biofuels and feedstock 4. Development Program on Land Use to Expand the Feedstock (2010–2022)	2021: Bioethanol: 9 million litre/year 2021: Biodiesel: 7.2 million litre/year
Viet Nam	No	1. Prime Minister's Decision No. 177 2. Mandatory from 1 Dec. 2014: E5 (7 provinces and cities) 3. Financial support for biofuel program (Total amount: VND259.2 billion from 2007–2015)	2025: E5 and B5 (1.8 million tonnes total of biofuels)

Note: (a) Convert to US$0.06/liter with the exchange rate of US$1 = 6.8 yuan.
Source: Annex: Biofuel Policies in East Asian Countries.

(2) Development Program

As shown in Table 2.2, all of the countries in this region have introduced biofuel development programs or targets, except Brunei Darussalam and Cambodia. The Philippines and Indonesia have mandated the use of bioethanol and biodiesel at the national level. On the other hand, Australia has obligated to utilise E4 and B2 at the state level and South Korea has mandated the use of B2 across the country. In Thailand, New Zealand, and Malaysia, the governments have introduced various promotion programs on a national scale and Viet Nam has announced the utilisation of E5 after December 2014.

It is clear that the development stages or levels in each country are totally different. The local government is the principal player in China and India for biofuel introduction. The development stage in Viet Nam and Myanmar remains at the level of planning. Brunei Darussalam and Cambodia have not yet announced any policy or program to introduce biofuels.

(3) Target

Among the member countries, the biofuel targets are also quite different. China, Japan, and Thailand have a quantitative target. On the other hand, Malaysia, the Philippines, South Korea, and Viet Nam have set their targets by blending share. Australia, India, Indonesia, and Lao Peoples' Democratic Republic (Lao PDR) have set their targets by the share of biofuels in total fuel consumption.

(4) RD&D

Due to the different levels of development and regional diversification, the levels of introduction and research, development, and demonstration (RD&D) of biofuels are also very different. The existing biofuel production plants are based on the first-generation technology. The first-generation biofuel technologies are already mature in the region and most of them are rich in feedstock supply by domestic production. The RD&D activities in most of the countries in this region are focused on crop productivity improvement. Some of them try to avoid the impact on the existing food supply system and deforestation by promoting non-edible crops such as nipal, jatropha, and pongamia. Expectation for jatropha is high, and the boom of cultivation of jatropha has occurred at a certain period of time.

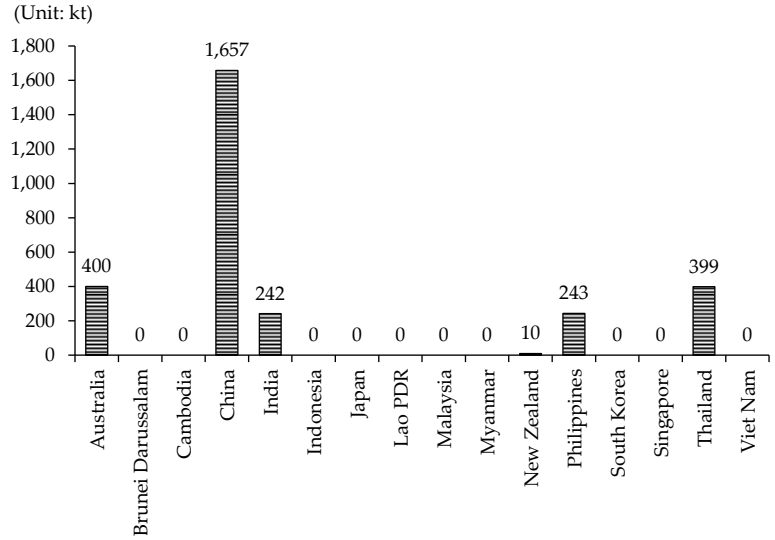
Next-generation biofuel technology development is essential in the sustainable supply system. Japan, South Korea, China, Thailand, and India are leading in commercialisation on cellulosic technology by biomass feedstock to produce bioethanol. Biodiesel production technology using algae as raw material is being widely developed by each country.

2.2. Development Status

(1) Biofuel Consumption by Country

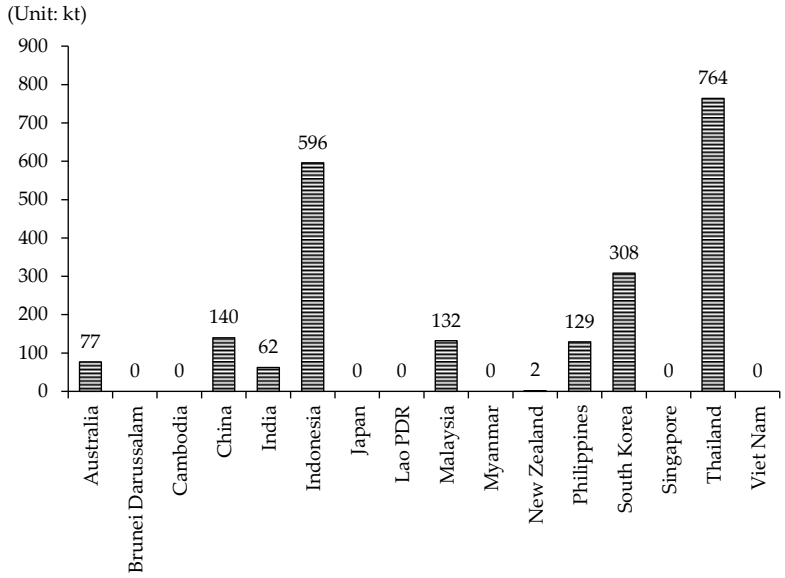
Figure 2.1 and Figure 2.2 show the biofuel consumptions by each country for 2012. In this region, the total consumption of bioethanol is 2.95 million tonnes while that of biodiesel is 2.21 million tonnes.

Figure 2.1 Bioethanol Consumption by Country in 2012



Sources: International Energy Agency (IEA), (2014), World Energy Balances and Statistics 2014. Paris: IEA.

Figure 2.2 Biodiesel Consumption by Country in 2012



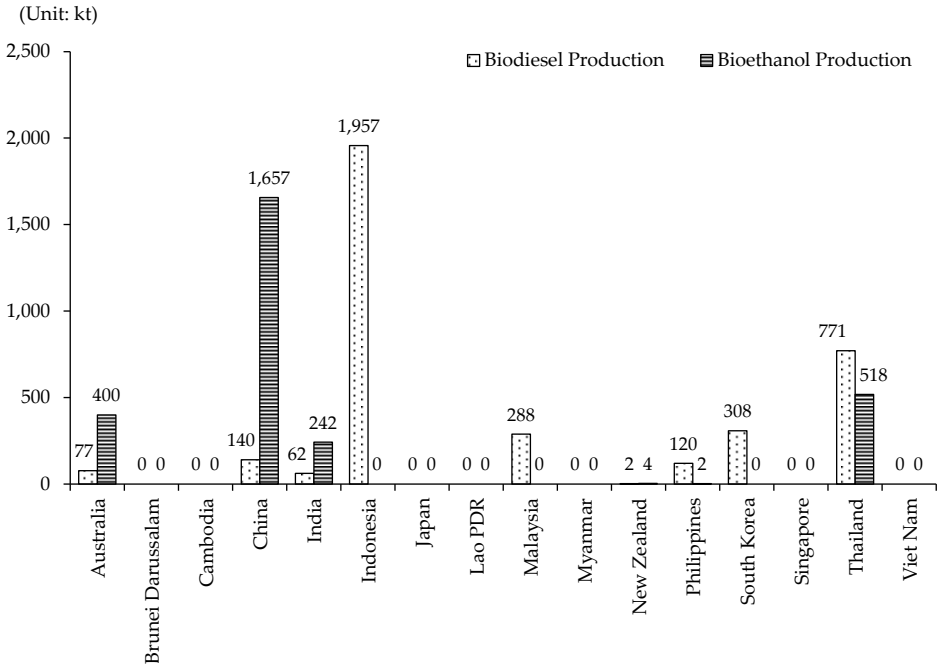
Source: International Energy Agency (IEA), (2014), World Energy Balances and Statistics 2014. Paris: IEA.

China consumes the largest amount of bioethanol in the region. According to the IEA statistic, bioethanol consumption in China was 1.657 million tonnes while biodiesel was 0.14 million tonnes in 2012. Thailand comes second, consuming 0.764 million tonnes of biodiesel and 0.399 million tonnes of bioethanol in the same year.

(2) Biofuel Production and Capacity by Country

The production of bioethanol is approximately 2.823 million tonnes across the region in 2012. Most of the production of bioethanol comes from China (1.657 million tonnes), Thailand (0.518 million tonnes), Australia (0.40 million tonnes). On the other hand, approximately 3.725 million tonnes of biodiesel were produced in the whole region, where Indonesia (1.957 million tonnes) and Thailand (0.771 million tonnes) accounted for the majority of the production.

Figure 2.3 Biofuel Production by Country in 2012



Sources: International Energy Agency (IEA), (2014), World Energy Balances and Statistics 2014. Paris: IEA.

The total production capacity of the existing bioethanol plants in 2012 is 5.6 million kL per year. Biodiesel production capacity is approximately 14.3 million kL at the same year. China has the highest annual production capacity of bioethanol and Thailand comes second. China's annual production of bioethanol is 2.6 million kL in 2012 while Thailand has a production capacity of 1.4 million kL per year, followed by Viet Nam and Australia. However, the specific figures of bioethanol production in the latter two countries are not available. About 80 percent of bioethanol production is exported in the case of Viet Nam.

Table 2.3 Biofuel Production Capacity by Country in 2012

	Number of Plant	**Capacity (million litres/year)**	**Bioethanol Feedstock**
Australia [1)]	3	440	Sugarcane (molasses), sorghum, waste starch
Brunei Darussalam	0	0	No feedstock
Cambodia	1	0.16	Cassava
China [2)]	5	2,600	Maize, cassava
India	na	na.	Molasses
Indonesia	8	416	Sugarcane (molasses), cassava
Japan	na	na	Sugar cane (molasses)
Lao PDR	na	na	Cassava
Malaysia	0	0	No feedstock
Myanmar	3	8.3	Sugar cane (molasses)
New Zealand	1	15~20	Whey, industry waste, import
Philippines	5	163	Sugarcane (molasses), import
South Korea	na	na	na
Singapore	0	0	No feedstock
Thailand [3)]	21	1,420	Sugarcane (molasses), cassava
Viet Nam [4)]	6	550	Sugarcane (molasses)
Total	53	5,612	

Note : na = not available.
Source: Annex: Biofuel Policies in East Asian Countries

Table 2.4 Biofuel Production by Country in 2012

	Number of Plant	Capacity (million litres/year)	Biodiesel Feedstock
Australia [1)]	11	360	Tallow, used cooking oil, palm oil
Brunei Darussalam	0	0	No feedstock
Cambodia	0	0	Used cooking oil
China [2)]	na.	na.	Used cooking oil
India	6	480	Used cooking oil, animal fats and tallow, other oils
Indonesia	25	5,600	Palm oil
Japan	na.	na.	Used cooking oil
Lao PDR	0	0	No feedstock
Malaysia	30	3,920	Palm oil
Myanmar	6	0.6	Jatropha, palm oil
New Zealand	7	70	Animal fats and tallow, used cooking oil, rapeseed
Philippines	9	463	Coconut, jatropha
South Korea	na.	na.	Used cooking oil, import
Singapore	6	1,469	Palm oil, used cooking oil, animal fats
Thailand [3)]	15	1,920	Palm oil, used cooking oil
Viet Nam [4)]	0	0	na
Total	115	14,282	

Notes:
1) Data until December 2013, Biofuel Association of Australia (BAA).
2) The number of plants and capacity for bioethanol are not included in the production for food.
3) Until November 2012. Not specific for fuel use.
4) Until February 2013. The total ethanol plant capacity is 12.51 million litres/day until the end of 2013. Of the production, 80 percent is for export.
Source: Annex: Biofuel Policies in East Asian Countries

On the other hand, Indonesia (5.6 million kL), Malaysia (3.9 million kL), and Thailand (1.9 million kL) have an overwhelming amount of production capacity for biodiesel. These three countries are the major producers of palm oil in the world; they have an advantage in the production of biodiesel as a raw material from palm oil. The case of Singapore is also noteworthy. Although, in Singapore, agriculture land is not available for use in the production of feedstock, the country tries to import the raw palm oil from Malaysia and Indonesia to produce biodiesel for export purpose. At the time of the study, Singapore has a biodiesel production capacity of 1.47 million kL

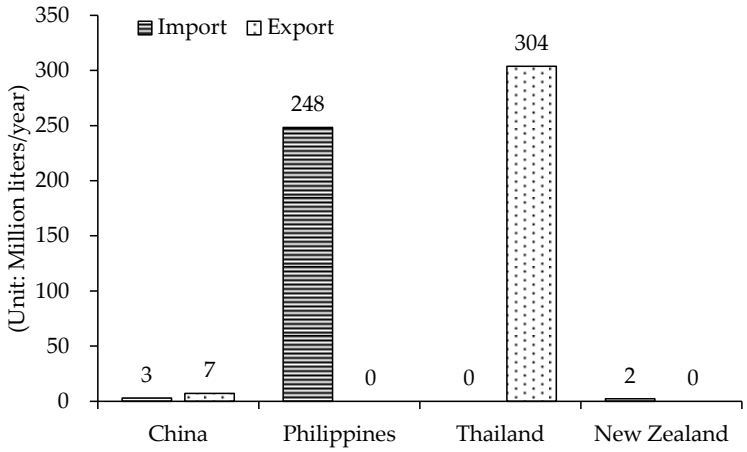
per year. The Philippines has about 463,000 kL per year of production capacity, where most of the feedstock comes from coconut oil.

(3) Biofuel Trade

Trade of biofuels in the region is not so active. According to the 2012 data, the volume of bioethanol trade is approximately 565,000 kL per year. Thailand is the main exporter in the region with 304,000 kL per year, while the Philippines is the main importer of bioethanol with 248,000 kL per year.

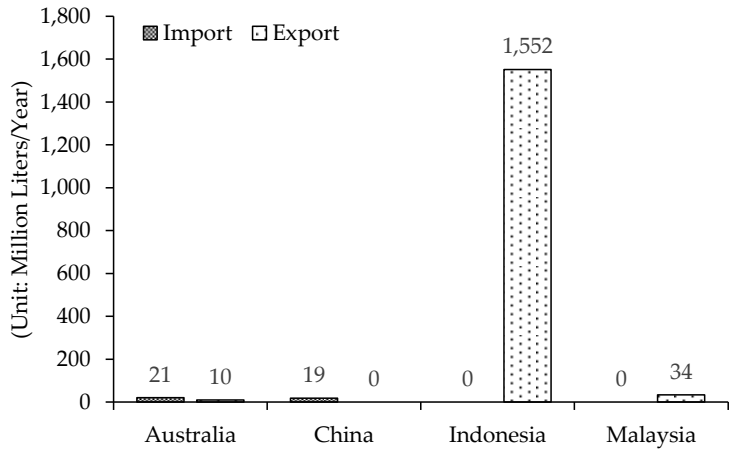
Biodiesel trading volume of ASEAN+6 in 2013 is 1.6 million kL overall. As the leading country of biodiesel export in this region, Indonesia has exported 1.55 million kL in the same year. Malaysia was next with 34,000 kL biodiesel exported in the same period. Most of the biodiesel production from these two countries is for export to the European Union market but only a small amount of export is provided to the member countries in the region.

Figure 2.4 Bioethanol Trade in 2012



Sources: USDA GAIN Report (2012b), (2012e), and (2012f); (2014), World Energy Balances and Statistics 2014. Paris: IEA.

Figure 2.5 Biodiesel Trade in 2012



Sources: USDA GAIN Report (2012a), (2012b), (2012g), and (2012h).

Table 2.5 shows a tax rate applied to the import of biofuels in each country in the region. The main tariff is made up of most favored nation (MFN) tax rate, goods sales tax, and the additional tax rate.

Table 2.5 Biofuels Import Duty and Related Taxes

Import to country	MFN duty rate	Sales tax	Additional duties and taxes
Australia	5% + AU$78.44 per litre	10%	•Import processing charge (AU$40.20)
China	40%	17%	
India	150%	No sales tax	•Landing charges (1% CIF) •CESS (3% (Duty + Countervailing duty)) •Additional Countervailing Duty (4% (CIFD + Landing charges + Countervailing duty + CESS)
Indonesia	30%	10%	•Excise (IDR50,000.00 per litre) •Income tax (7.5% CIFD)
Japan	0% + JP¥38.1 per litre	8%	
Malaysia	0% + RM60.00 per liters	5%	•Excise (RM22.50 per litre, 15%)
New Zealand	0% + NZ$50.284 per litre	15%	•Import entry transaction fee (NZ$46.89)
Philippines	10%	12%	
Singapore	0%	7%	•Excise (SGD88.00 per litre)
South Korea	30%	10%	•Education tax (10% (Special consumption tax, or liquor tax, or interior tax, whichever is applicable)) •Liquor tax (W57.00 per litre)
Thailand	0% + THB80.00 per litre	7%	•Excise (0.1%, THB0.05 per litre) •Interior tax (10% of excise)
Viet Nam	40%	10%	•Special sales tax (65%)

Source: Duty rate is by Duty Calculator. http://www.dutycalculator.com**,** accessed on May 20, 2014.

(4) Feedstock supply

Feedstock Available

Currently, sugarcane, maize, and cassava are the main raw materials for bioethanol production in this region. ASEAN+6 also produces most of the rice, wheat, and sweet potato in the world. These crops are suitable as a feedstock for bioethanol, but not much amount is being used as a feedstock for fuel production because their usage as food is more important. The production of sugarcane in this region accounts for 36.4 percent of the world's production and 30.5 percent for cassava, especially since cassava is not consumed as a major food in the East Asian region. In this sense, cassava has potential as a feedstock for bioethanol.

As for oil crops, coconut and palm oil are the main feedstocks for biodiesel in this region. Production of palm oil accounts for 86.3 percent while coconut accounts for 79.7 percent of the world production.

Table 2.6 Production by Crop in ASEAN+6 (per 1,000 ha)

	Cassava	**Rice (paddy)**	**Sorghum**	**Sugarcane**	**Coconuts**	**Oil, palm fruit**
Australia	0	723	1,935	25,182	0	0
Brunei Darussalam	3	1	0	0	0	0
Cambodia	8,034	8,779	0	469	66	0
China	4,500	201,001	2,051	114,435	239	650
India	8,076	157,900	7,003	342,382	10,280	0
Indonesia	24,010	65,741	0	24,000	17,500	101,700
Japan	0	10,500	0	1,000	0	0
Lao PDR	743	3,066	0	1,222	0	0
Malaysia	33	2,576	0	800	563	94,558
Myanmar	730	29,010	223	9,690	420	0
New Zealand	0	0	0	0	0	0
Philippines	2,210	16,684	0	30,000	15,245	541
South Korea	0	6,304	2	0	0	0
Singapore	0	0	0	0	0	0
Thailand	21,912	34,588	52	95,950	1,055	10,777

Viet Nam	9,898	42,398	0	17,540	1,202	0
ASEAN+6 (Total)	80,149	579,272	11,266	662,670	46,569	208,225
Share of the World Total (%)	30.5	79.9	19.3	36.4	79.7	86.3
World + (Total)	262,753	724,960	58,412	1,819,420	58,419	241,227

Source: FAOSTAT (2014).

Land Use

According to the FAO database, the ASEAN+6 member countries had a total land area of 2.50 billion ha in 2011, where 1.25 billion ha (around 50% of total land area) was defined as agricultural land. The total harvested area from land used for cultivation was 520 million ha. This means that only 41 percent of the agricultural area was utilised in 2011. Most of the remaining agricultural areas were "permanent meadows and pastures" type of land, which was not suitable for agriculture. Looking at each country data, some had a ratio of cultivated area to agriculture area as being relatively low. Although the percentage is not large, the expansion of cultivated area is still possible in some countries.

Table 2.7 Utilisation of Land by Country in 2011 (1,000 ha)

	Country area	Land area	Agricultural area	Arable land	Permanent crops	Permanent meadows and pastures	Forest area	Other land	Inland water	Area harvested (1,000 Ha)	Land Utilization Rate from Agricultural area (%)
Australia	774,122	768,230	409,673	47,678	400	361,595	148,376	210,181	5,892	24,869	6.1
Brunei	577	527	11	3	5	3	378	137	50	15	134.1
Cambodia	18,104	17,652	5,655	4,000	155	1,500	9,967	2,030	452	3,974	70.3
China	960,000	932,749	519,148	111,599	14,716	392,834	209,624	203,977	27,251	173,675	33.5
India	328,726	297,319	179,799	157,350	12,300	10,149	68,579	48,941	31,407	198,141	110.2
Indonesia	190,457	181,157	54,500	23,500	20,000	11,000	93,747	32,910	9,300	40,099	73.6
Japan	37,796	36,450	4,561	4,254	307		24,988	6,901	1,346	2,997	65.7
Laos	23,680	23,080	2,378	1,400	100	878	15,673	5,029	600	1,438	60.5
Malaysia	33,080	32,855	7,870	1,800	5,785	285	20,369	4,616	225	6,600	83.9
Myanmar	67,659	65,329	12,558	10,786	1,464	308	31,463	21,308	2,330	17,606	140.2
New Zealand	26,771	26,331	11,371	471	71	10,829	8,261	6,699	440	282	2.5
Philippines	30,000	29,817	12,100	5,400	5,200	1,500	7,720	9,997	183	14,077	116.3
R.Korea	9,990	9,710	1,756	1,492	206	58	6,215	1,739	280	1,642	93.5
Singapore	71	70	1	1	0		2	67	1	1	161.6
Thailand	51,312	51,089	21,060	15,760	4,500	800	18,987	11,042	223	20,811	98.8
Vietnam	33,096	31,007	10,842	6,500	3,700	642	13,941	6,224	2,089	13,813	127.4
Total	2,585,440	2,503,372	1,253,283	391,993	68,909	792,381	678,290	571,799	82,068	520,040	41.5

Source: FAO Statistics Division, http://faostat.fao.org/, 15 May 2014.