Biofuels Data and Social Accounting Matrices Prepared for Policy Assessment Models based on the GTAP 7 Data Base

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by

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Conversion rates

1 MT Gasoline	=	1342 Liters	=	1.03 toe
1 MT Ethanol	=	1267 Liters	=	0.64 toe
1 MT Diesel	=	1195 Liters	=	1.02 toe
1 MT Biodiesel	=	1136 Liters	=	0.90 toe
1 Gallon	=	3.79 Liters		

Exchange Rates (from one unit local currency to US Dollar)

Currency	Code	2004	2005	2006	2007	2008
Australian Dollar	AUD	0.7368	0.7594	0.7547	0.8387	0.8274
Brazilian Real	BRL	0.3423	0.4097	0.4609	0.5156	0.5399
Canadian Dollar	CAD	0.7697	0.8163	0.8822	0.9272	0.9166
Chinese Yuan	CNY	0.1208	0.1217	0.1255	0.1315	0.1401
Euro	EUR	1.2439	1.2399	1.2570	1.3710	1.4299
Indian Rupee	INR	0.0221	0.0226	0.0221	0.0244	0.0225
Indonesian Rupiah	IDR	0.0000	0.0001	0.0001	0.0075	0.0001
Japanese Yen	JPY	0.0093	0.0091	0.0086	0.0043	0.0093
Malaysian Ringgit	MYR	0.2632	0.2641	0.2729	0.2910	0.2875
New Zealand Dollar	NZD	0.6644	0.7035	0.6510	0.7363	0.6807
Phillippine Peso	PHP	0.0000	0.0170	0.0195	0.0230	0.0216
Sourth Korea Won	KRW	0.0009	0.0010	0.0010	0.0011	0.0009
Thai Baht	THB	0.0248	0.0248	0.0264	0.0310	0.0290

Source: Calculated by the average value of the twelve-month data, obtained from GoCurrency.com.

CPI Inflation Rates

	US Dollar
2000	1.10
2001	1.07
2002	1.05
2003	1.03
2004*	**1.00**
2005	0.97
2006	0.96
2007	0.91
2008	0.88

* Base year is 2004.

Source: Bureau of Labor Statistics, United States Department of Labor.

Abbreviations

ACP	African, Caribbean and Pacific Group of States
ASEAN	Association of Southeast Asian Nations
CAN	Andean Community Countries
CBI	Caribbean Basin Initiative
CGE	computable general equilibrium model
CGF	maize gluten feed
CGM	maize gluten meal
CIF	Cost, Insurance and Freight
CME	coco-methyl ester
CN	Combined Nomenclature Code
CPC	Central Product Classification
CPO	crude palm oil
CTPA	United States-Colombia Trade Promotion Agreement
DDGS	Distillers Dries Grains with Solubles
EAS	East Asia Summit
EBA	Everything But Arms Initiative
ETBE	ethyl-tertio-butyl-ether
EU	European Union
EU MS	EU Member State
FAME	fatty-acid-methyl-ether
FOB	Freight on Board
FTA	Free Trade Agreement
GSP	Generalized System of Preferences
GTAP	Global Trade, Assistance, and Production (database developed by the Center for Global Trade Analysis, Purdue University)
hl	hectoliter
HS	Harmonized System Commodity Description and Coding System
JME	jatropha-methyl ester
KL	thousand liters
LDC	Least Developed Country
MENA	Middle East and North Africa countries
MFN	Most Favored Nation
ML	million liters
MT	metric ton
MTBE	methyl-tertio-butyl-ether
OECD	Organisation for Economic Co-operation and Development
ROW	rest of the world
SPS	Agreement on the Application of Sanitary and Phytosanitary Measure
toe	ton of oil equivalent
tpe	total primary energy
VAT	value added tax

1. Introduction

Liquid biofuels have a potential to contribute to a wide range of policy objectives: foreign exchange savings by reducing the volume of fossil fuel imports, improving energy security by reducing dependence on uncertain petroleum imports, mitigating GHG emissions by substituting fossil fuels in transportation sector, improving urban air quality, and creation of rural employment and incomes, especially in developing countries. Motivated by the benefits of biofuels, many countries, both developed and developing, have set targets for substituting gasoline and diesel by biofuels and adopted policies to support biofuels production.

Production and use of both ethanol and biodiesel have increased significantly in recent years. Production of fuel ethanol tripled between 2000 and 2007. Biodiesel output witnessed an even more pronounced expansion over the same period, having grown from less than one billion liters to almost 11 billion liters (OECD and FAO, 2008). Profiting from the favourable climate conditions for the cultivation of feedstocks like sugarcane, cassava and oil palm, production of both bioethanol and biodiesel is growing steadily in several countries in the Southeast Asia including Thailand, Indonesia, Malaysia, and the Philippines, etc. (IEA, 2010a). However, a biofuel boom in these countries raises concerns about potential social and environmental pressures. Possible impacts include increases in food prices and reduced food security in low income societies and environmental consequences resulting from land-use and land-cover change, which contribute to GHG emissions and loss of biodiversity.

Government policies promoting biofuels will have economic impacts on different sectors, especially agriculture, transportation and fossil fuels, as well as social impacts on employment, particularly in rural areas in developing countries. To assess these economy-wide impacts within a country or among countries, CGE models are usually considered as an appropriate framework.

The purpose of this work is to provide biofuels data of major production and consumption countries for the construction of national social accounting matrix (SAM) based on the GTAP 7 Data Base (Center for Global Trade Analysis, 2008). SAMs can then be used as the basis for building Computable General Equilibrium (CGE) type of models. Similar works have been conducted for the GTAP 6 Data Base (Taheripour, et al., 2008) and the GTAP 7 Data Base (Valin, et al., 2009). The major difference of our work from that of Taheripour and his colleagues is that multiple feedstocks for the production of bioethanol and biodiesel for each producing country are taken into account in our study. Our focus is on major biofuels production and consumption regions taking into account the development trend in developing countries, in particularly the Southeast Asia, China and India.

We constructed SAMs for 18 economies of major biofuels production and consumption, including Australia, Brazil, Canada, China, Columbia, the EU, India, Indonesia, Japan, the Republic of Korea, Malaysia, New Zealand, Peru, the Philippines, South Africa, Thailand, the United States and Vietnam. The construction of SAMs gives explicit representations of major feedstocks for the production of bioethanol and biodiesels, respectively, in terms of their relevant sector classifications by the GTAP 7 Data Base. Sectors providing inputs to the biofuels manufacturing (such as chemicals and energy) and other sectors related to the biofuels production chains (such as transportation and by-products) are also included. Two new sectors representing bioethanol and biodiesels are added except for sectors currently

responsible for the production of biofuels in respective countries specified by the GTAP 7 Data Base. Others sectors in the GTAP 7 Data Base are aggregated into “others” and can be easily disaggregated to sectors of specific interest to the researchers by using GTAPAgg7 Software.

The main works include: (i) data collection for the feedstocks, unit production costs, quantity of production, consumption and trade, taxes and subsidies; (ii) separation of biofuels production from relevant sectors in the GTAP 7 Data Base; and (iii) construction of SAMs for 18 economies. This report provides detailed explanations on how to build the data from available information sources. Only first-generation biofuels are included. Most of the data is for the time period of 2004-2007. Value data is converted to US dollars at the value in 2004.

SAMs for 18 economies can be available upon request through email.

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2. Biofuels Production and Consumption

Biofuels industry has been developing rapidly in recent years. It is difficult to obtain consistent data from different sources on the production and consumption of biofuels at both the world level and national level. There are several reasons.

First, biofuels have broad definitions and statistics on biofuels depend on specific definitions, which, unfortunately, are not provided in most cases. For example, the Energy Statistics of OECD Countries (IEA, 2010b) defines liquid biofuels as biogasoline, biodiesels and other liquid biofuels which are not included in either biogasoline or biodiesels. Biogasoline then includes bioethanol, biomethanol, bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol). Biodiesels includes biodiesel, biodimethylether, Fischer Tropsh (Fischer Tropsh produced from biomass), cold pressed bio-oil and all other liquid biofuels which are added to, blended with or used straight as transport diesel. In other cases, biofuels only include bioethanol and biodiesel.

Second, statistics on ethanol usually do not distinguish its usage for industrial purpose, for beverage or for using as a fuel for vehicles.

Third, in many countries, a sudden increase in demand can be observed, due mainly to the adoption of mandatory blending targets or other policies to promote a partial substitution of biofuels for conventional fossil fuels used in transportation. In every year, there will be some new plants under construction (usually with larger production capacity than current ones), not only in the existing producing countries but also in countries which start to produce domestically. Under such rapidly changing situation in biofuels industry, it is difficult to take statistics and some sources provided data based on the estimation taking into account of new capacity installed or to be installed in the coming year.

Forth, the level of production and trade are influenced by many factors, such as domestic biofuels policies, prices and the availability of feedstocks, prices of fossil fuels (in particular gasoline and diesel), and

domestic trade regimes (e.g. quota and tariffs). Under such contingencies, estimate-based data can be quite different from the real-world situation, which contributes to the inconsistency of data among different sources.

In this report, we use the data provided in OECD-FAO Agricultural Outlook 2008-2017 (OECD and FAO, 2008). As mentioned above, data on production, consumption and trade of biofuels can be quite different from one year to another. In order to provide base-year data on biofuels, we use the average levels of 2005-2007 (Table 1).

Data from other sources is provided in Appendix A as references.

Table 1 Bioethanol (Estimated average of 2005-2007)

Country	Production (ML)	Domestic consumption (ML)	Fuel consumption (ML)	Energy share in gasoline fuel consumption (%)	Net Trade (ML)
Australia	63	63	63	0.22	0
Brazil	17,396	14,595	13,499	32.31	2,801
Canada	762	939	735	1.26	-178
China	5,564	4,998	1,565	1.66	566
Columbia	272	303	268	3.34	-31
EU27	2,049	4,649	2,127	1	-1,783
India	1,411	1,678	267	1.73	-267
Indonesia	177	147	0	0	30
Japan	n.a.	n.a.	n.a.	n.a.	-568
Peru	16	11	0	0	5
Philippines	62	109	17	0.24	-47
South Africa	410	99	0	0	310
Thailand	285	266	134	1.26	19
US	21,478	22,713	21,094	2.63	-1,235
Vietnam	140	134	0	0	6
Total	**50,085**	**50,704**	**39,769**	**n.a.**	**-372**

Note: n.a.: not available.

Source: OECD and FAO (2008).

Table 2 Biodiesel (Estimated average of 2005-2007)

Country	Production (ML)	Domestic consumption (ML)	Energy share in diesel fuel consumption (%)	Net Trade (ML)
Australia	199	199	2	0
Brazil	158	158	0	0
Canada	46	46	0	0
EU27	5,095	5,436	2	-341
India	277	277	1	-
Indonesia	241	47	0	168
Malaysia	148	n.a.	0	148
US	1,429	852	0	577
Total	**7,593**	**7,015**	**n.a.**	**552**

Note: n.a.: not available.

Source: OECD and FAO (2008).

3. International Trade

Data about fuel ethanol trade are imprecise due to various potential uses of ethanol (fuel, industrial or for beverage use) and also because of the lack of proper codes for biofuels in the Harmonized System Commodity Description and Coding System (HS) (UNCTAD, 2006). Fuel ethanol is traded under HS 2207, which covers denatured alcohol (HS 2207.20) and undenatured alcohol (HS 2207.10). Both can be used as fuel ethanol, but denatured ethanol is often used as solvent (UNCTAD, 2006). Therefore, most fuel-grade ethanol is traded in undenatured form. For biofuels related trade regimes, please see Appendix B.

Brazil is the main exporter, while the US, EU, Canada and Japan are the main importers in 2008. Almost 97% of the Brazilian exports in 2005 were as undenatured ethanol with high degree strength (F.O. Licht, 2006). It is estimated that 96% of the total exports were for fuel ethanol (UNCTAD, 2006). According to the FAPRI (2009), more than 95% of global exports in 2008 were directed towards the EU. Indonesia and Malaysia are the main exporters. Due to specifics in the US biofuels policies, the US also appears as a major biodiesel trader. Within the US imported biodiesel is blended with small quantities (less than 1%) of fossil diesel. With this blending, the biodiesel qualifies for the domestic "blenders' tax credit". Subsequently, this high-level blend is re-exported to the EU where it benefits from additional incentives due to excise tax reductions (OECD, 2008).

Table 3 Brazilian exports of ethanol in recent years

Country	2005		Country	2004	
	ML	US$/l[1]		ML	US$/l[2]
India	414.2 (15.9%)	0.278	India	478.6 (19.9%)	0.194
Japan	317.9 (12.2%)	0.293	US	424.6 (17.6%)	0.189
Netherlands	264.3 (10.2%)	0.301	Korea	278.4 (11.6%)	0.201
US	260.6 (10.0%)	0.297	Japan	223.2 (9.3%)	0.199
Sweden	245.1 (9.4%)	0.286	Sweden	193.4 (8.0%)	0.239
Total/avg	**2598.5**	**0.294**	**Total/avg**	**2408.3**	**0.207**

Source: Walter, et al., 2007.

Note: 1. Value in 2005. 2. Value in 2004.

Table 4 Bioethanol trade flows (Estimated average of 2005-2007, in ML)

Importing countries / Exporting countries	Canada	Columbia	EU27	Japan	India	Philippines	US	ROW	**Total exports**
Brazil	178	31	1473	342	267		280	230	**2,801**
China				218			348		**566**
Indonesia				2		28			**30**
Peru							5		**5**
Thailand						19			**19**
South Africa			310						**310**
Vietnam				6					**6**
ROW							602		**602**
Total imports	**178**	**31**	**1,783**	**568**	**267**	**47**	**1,235**	**230**	

Sources: Estimated based on the trade data from Table 1 and Table 3 and other sources (FAPRI, 2009; Walter, 2009; Hess, et al., 2009) by using the principle of the nearest shipping distance.

Table 5 Biodiesel trade flows (Estimated average of 2005-2007)

Importing countries / Exporting countries	EU27	ROW	**Total exports**
US	220	357	**577**
Indonesia	64	104	**168**
Malaysia	57	91	**148**
Total imports	**341**	**552**	**893**

Sources: Estimated based on the trade data from Table 2 and other sources using the principle of the nearest shipping distance (FAPRI, 2009).

4. Production Costs

Detailed unit production costs are not available for each producing country. Table 6 provides unit production costs of ethanol production in Brazil using sugar cane as feedstocks, in the US using maize as feedstocks and in the EU using wheat and sugar beet as feedstocks. The range of production costs for some countries using different feedstocks is provided in Table 7. As indicated in Table 9, feedstock costs account for the largest share in total production costs and are usually influenced by changes in the prices of crops. We therefore assume that the cost difference among producing countries using the same feedstocks comes from the difference in feedstock costs.

Whims (2002) indicated that plant size has a major effect on cost. The cost difference between a small dry-mill plant (e.g. with annual capacity of 55 ML) and a large one (e.g. with annual capacity of 150 ML) in the US can be as much as US$ 0.05-0.06 per liter (US$ 0.03 per liter difference in capital costs and US$ 0.02-0.03 per liter difference in operating costs). The production costs provided in Table 6 are mainly based on large plants.

In addition to the production costs, cost of transporting, storage/splash blending and distributing can add another US$ 0.012 – 0.072 per liter (IEA, 2002) (See Table 8). Such costs are estimated as US$ 0.2 per

liter by Steenblik (2007b). In our estimation, we use 0.012 US$ (at 2000 value) per liter or 0.0132 US$ (at 2004 value) per liter for all selected countries.

Table 6 Unit production costs (2004 US$/l)

Cost item	Biodiesel/EU (Vegetable Oil)	Ethanol/EU (Wheat)	Ethanol/EU (Sugar Beet)	Ethanol/US (Maize)	Ethanol/Brazil (Sugar Cane)
Feedstock cost	**0.48**	**0.35**	**0.30**	**0.19**	**0.13**
Labor /administration/ maintenance	0.01	0.02	0.02	0.03	0.01
Chemical cost	0.03	0.02	0.02	0.02	0.00
Interest payment	0.004	0.23	0.18	0.00	0.01
Total processing cost	**0.044**	**0.27**	**0.22**	**0.05**	**0.03**
Energy costs: Methanol	0.03	0.00	0.00	0.00	
Energy costs: Heat	0.00	0.05	0.05	0.05	
Energy costs: Electricity	0.01	0.01	0.01	0.01	
Total energy cost	**0.04**	**0.06**	**0.06**	**0.06**	
Energy feed by-product credits	0.00	-0.18	-0.08	-0.05	
Protein feed by-product credits	0.00	0.00	0.00	-0.02	
Other by-product credits	-0.05	0.00	0.00	0.00	
Total by-product credits	**-0.05**	**-0.18**	**-0.08**	**-0.07**	
Capital recovery	**0.024**	**0.066**	**0.066**	**0.055**	**0.062**
Net production cost	**0.54**	**0.57**	**0.56**	**0.28**	**0.22**

Source: Complied based on different sources (Smeets et al., 2005; Aglink Database; OECD, 2006; IEA, 2002; Taheripour, et al., 2008).

Table 7 Range of unit production costs

Country	Bioethanol			Biodiesel		
	Feedstocks	In local currency[1]/l	2004 US$/l	Feedstocks	In local currency[1]/l	2004 US$/l
Australia	Grains (wheat and sorghum)		0.46	Used cooking oil		0.28
	Cane molasses		0.32	Canola		0.57
	Sugarcane		0.65	Tallow		0.35
Brazil	Sugarcane		0.22	n.a.[2]	1.4 R$/l[3]	0.48
Canada	Corn and wheat	0.36-0.46 CAN$/l	0.30-0.39	Yellow grease	0.48CAN$/l	0.41
				Tallow	0.61CAN$/l	0.52
				Canola oil	0.81CAN$/l	0.68
China	Corn	3.95RMB/l	0.47	Used cooking oil	3.52RMB/l	0.42
	Sweet sorghum	3.16RMB/l	0.38			
	Cassava/sweet potato	3.55RMB/l	0.43			
India	Sugar molasses		n.a.[2]	Jatropha	35-45Rs/l	0.85-1.1
Indonesia	Sugarcane molasses		n.a.[2]	Palm oil		0.37
				Jatropha		0.44
Japan[4]	Sugarcane molasses		1.09			
	Wheat		1.15	Rapeseed		2.64
Republic of Korea[5]				Used cooking oil		0.82
				Rapeseed		0.48 (with subsidy)-1.25
				Soybeans		0.96
Peru	Sugarcane		0.23	Palm oil		0.22
Thailand	Cassava		0.49	Palm oil		0.78
	Cane molasses		0.42	Used cooking oil		0.62
US	Maize		0.42-0.44	Soybeans		0.35-0.72
	Lignocellulosic biomass		0.48-0.60	Used cooking oil		0.24-0.46
				Algae		1.37-1.82

Source: APEC (2008); GAIN (2007b, 2007g).

Note: 1. Value in 2007 and the exchange rates in 2007 are used; 2. n.a.: Not available; 3. Value of local currency in 2004; 4. At experimental stage; 5. Currently no fuel ethanol production.

Table 8 Transport, storing and dispensing costs for ethanol

Item	Cost range (2000 US$/l)	Cost range (2004 US$/l)
Shipping cost	0.010-0.050	0.011-0.055
Storage/blending cost	0.000-0.002	0.000-0.0022
Dispensing cost	0.002-0.020	0.0022-0.022
Total cost	**0.012-0.072**	**0.0132-0.0792**

Source: IEA (2002).

Table 9 Unit production costs by percentage (in %)

Cost item	Biodiesel/EU (Vegetable Oil)	Ethanol/EU (Wheat)	Ethanol/EU (Sugar Beet)	Ethanol/US (Maize)	Ethanol/Brazil (Sugar Cane)
Feedstock cost	**89%**	**62%**	**54%**	**68%**	**59%**
Labor /administration/ maintenance	2%	3%	4%	11%	7%
Chemical cost	5%	3%	4%	6%	1%
Interest payment	1%	41%	32%	0%	5%
Total processing cost	**8%**	**48%**	**39%**	**17%**	**13%**
Energy costs: Methanol	6%	0%	0%	0%	0%
Energy costs: Heat	0%	8%	8%	17%	0%
Energy costs: Electricity	2%	2%	2%	4%	0%
Total energy cost	**8%**	**10%**	**10%**	**20%**	**0%**
Energy feed by-product credits	0%	-31%	-15%	-17%	0%
Protein feed by-product credits	0%	0%	0%	-8%	0%
Other by-product credits	-9%	0%	0%	0%	0%
Total by-product credits	**-9%**	**-31%**	**-15%**	**-25%**	**0%**
Capital recovery	**4%**	**12%**	**12%**	**19%**	**28%**
Net production cost	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Calculated based on Table 6.

5. Biofuels Prices

The value of biofuels at FOB prices, represented by Brazil for ethanol and Europe for biodiesel, is shown in Table 10. We use the average price of 2002-2006 in our estimation.

Table 10 Biofuels prices

Biofuels	Price (US$/l at current value)		Price (US$/l at 2004 value)	
	Average 2002-06	2007 estimated	Average 2002-06	2007 estimated
Bioethanol[1]	0.314	0.42	0.315	0.382
Biodiesel[2]	0.838	0.947	0.840	0.862

Source: OECD and FAO (2008).

Note: 1. Brazil, Sao Paulo (ex-distillery); 2. Central Europe FOB price net of biodiesel tariff.

6. Support Policies

6.1 Taxes and subsidies

Domestic production of biofuels is directly supported by governments through two main instruments: border protection (mainly import tariffs) and volumetric production subsidies (Steenblik, 2007b).

Most countries producing bio-ethanol apply a most-favored nation tariff that adds at least 20%, or €0.10 per liter (see Table 11). Most fuel-grade ethanol is traded in undenatured form with the HS Code of 2207.10. The US distinguishes between ethanol intended for as a fuel from ethanol destined for beverages and other end uses, and charges an additional tariff. The import duty on ethyl alcohol applied by Australia

is set at the same level as the federal fuel excise tax on ethanol (and is among the highest in the OECD), however, domestically produced ethanol can qualify for a rebate of that tax (Steenblik, 2007b).

Table 11 Import tariffs on undenatured ethyl alcohol (HS 2207.10) (as of January 2007)

Country	At pre-tariff unit value of US$ 0.5/l			Exceptions
	Ad valorem equivalent (%)	Specific-rate equivalent (2007 US$/l)	Specific-rate equivalent (2004 US$/l)	
Australia	51	0.34	0.309	US, New Zealand
Brazil	0	0.00	0.000	Lowered from 20% in March 2006
Canada	9	0.047	0.043	FTA partners
EU	52	0.26	0.237	EFTA countries, developing countries in GSP
Japan	20.3			
Switzerland	46	0.232	0.211	EU, developing countries in GSP
US	28	0.138	0.126	FTA partners, CBI partners

Source: Steenblik, 2007a.

In addition to providing border protection, several countries and sub-national governments provide direct, production-related subsidies. The US grants a US$ 0.135 per liter tax credit to blenders according to the amount of pure ethanol they blend with gasoline. The federal government also grants a similar tax credit at US$ 0.268 per liter to companies that blend biodiesel produced from virgin agricultural fats and oils with petroleum diesel. Several US states provide their own volumetric subsidies to support in-state production of ethanol or biodiesel at rates equivalent to US$ 0.053 per liter or more (Steenblik, 2007b).

Australia has a broad range of policy instruments supporting biofuels production. These instruments include production targets, fuel excise taxes, fuel quality standards, and production subsidies and grants. Both ethanol and biodiesel are currently free of excise taxes. However, the Government originally intended to bring all untaxed fuels into the excise system as of 1 July 2008. Excise was to be levied on ethanol at the rate of 5.22 Australian cents per liter and on biodiesel at the rate of 7.629 Australian cents per liter, the same rate as petrol and diesel respectively. However, the excise-free period was more recently extended to 2011, via a rebate scheme (GAIN, 2006a). In addition, a capital subsidy program (concluded in 2004) of up to $A10 million per project (equivalent to 0.11 US$/l at 2004 value and plant lifetime of 15 years) was provided to subsidize capital expenditure in new or expanded biofuels production capacity producing a minimum of 5 ML of biofuels (Steenblik, 2007b).

In Canada, governmental subsidies as an operating incentive to producers of bioethanol and biodiesel from 2007 through 2009 will be up to US$ 0.09 (US$ 0.082 at 2004 value) per liter for bioethanol and US$ 0.18 (US$ 0.16 at 2004 value) per liter for biodiesel. In addition, Canada began exempting the ethanol portion of blended fuels from the federal excise tax on petrol (now US$ 0.087 per liter) in the 1990s and now grants an exemption to biodiesel as well (Steenblik, 2007b).

Most other countries support biofuels use through tax preferences tied to fuel excise taxes or sales taxes (see Table 12), taking the form of reductions in, or exemptions from, per-liter excise taxes normally charged on transport fuels.

Table 12 Value of excise tax reductions or rebates for liquid biofuels (as of January 2007)

Country	Bioethanol		Biodiesel	
	US$/l (2007 value)	US$/l (2004 value)	US$/l (2007 value)	US$/l (2004 value)
Australia	0.305	0.278	0.305	0.278
Brazil	0.239	0.217	0.106	0.096
Canada	0.087	0.079	0.349	0.318
EU*	0.566	0.515	0.552	0.502
Switzerland	0.591	0.538	0.573	0.521
US	0.135	0.123	0.268	0.244

Source: Second information from Steenblik, 2007b. (€1 =US$1.321 based on the source data)

Note: * Values in the EU are represented by the average levels in France, Germany and Italy, which are the largest producers in the EU.

Table 13 shows total biofuels subsidies on a per-liter basis. Ethanol subsidies range from about US$ 0.3–0.9 (2004 value) per liter, while the range of biodiesel subsidies is US$ 0.2–0.9 (2004 value) per liter.

Table 13 Approximate average support per liter of biofuels in selected OECD economies

Country	Bioethanol		Biodiesel	
	US$/l (2007)	US$/l (2004)	US$/l (2007)	US$/l (2004)
Australia	0.36	0.328	0.35	0.319
Canada	0.44	0.400	0.20	0.182
EU	1.00	0.910	0.70	0.637
Switzerland	0.60	0.546	1.00	0.910
US	0.28	0.255	0.55	0.501

Source: Steenblik, 2007a.

6.2 Mandated requirements

Complementing the aforementioned production-related support measures are various targets and mandated requirements for the amount or share of designated renewable fuels consumed as components of ethanol-petrol or biodiesel-diesel blends (Steenblik, 2007b).

Table 14 Voluntary and mandatory biofuels targets in selected countries

Country	Quantity or blending share
Australia	350 ML by 2010
Brazil	Mandatory blend of 20-25% anhydrous ethanol with petrol; minum blending of 3% biodiesel to diesel by July 2008 and 5% by the end of 2010.
Canada	5% renewable content in petrol by 2010 and 2% renewable content in diesel fuel by 2012
EU	2% by 2005; 5.75% by 2010 and 10% by 2020
Japan	6 billion liters by 2020
US	2.78% by volume of gasoline consumption in 2006 (15 GL) and 28 GL by 2012
China	15% of transport energy needs through use of biofuels by 2020
India	Proposed blending mandates of 5-10% for ethanol and 20% for biodiesel
Indonesia	5% biofuels in total energy by 2025
Philippines	5% bioethanol blend by 2009 and 10% in 2011

Source: Second information from FAO (2008), Steenblik (2007a and 2007b) and Olz and Beerepoot (2010).

7. Sectoral Split Schemes based on the GTAP 7 Data Base

We collected data for eighteen major biofuels production or consumption countries or regions. Since different countries use different feedstocks and multiple feedstocks are taken into account, we split biofuels production sectors from relevant sectors in the GTAP 7 Data Base (Center for Global Trade Analysis, 2008) for each country. We assume that all biofuels are consumed by domestic households.

First, we identified major feedstocks and the production share by each of the feedstocks in the total production of bioethanol and biodiesel, respectively, for each country. Based on the GTAP 7 Data Base (firms' domestic intermediates purchases at market prices, i.e. VDFM), we identified the sector in which most of a particular crop enter as inputs. The sector identified is determined as a corresponding sector from which biofuels production is separated. We conducted this for all types of feedstocks. For example, in Australia, wheat is one of the feedstocks for bioethanol production and most of wheat goes to the sector of food products (Code "ofd" in the GTAP 7 Data Base) as inputs. Therefore Sector "ofd" is separated into a bioethanol production sector and a sector producing food products excluding bioethanol.

Second, based on the GTAP 7 Data Base (VDFM and firms' imports of intermediates at market prices, i.e. VIFM), shares of domestic purchases and imports in providing the feedstocks to biofuels production are determined. Only imports of feedstocks are considered and other inputs, such as chemicals, heat and electricity, are assumed to be provided domestically. Sales of the by-products, such as animal feeds and chemicals, are assumed only in domestic markets.

Third, based on the unit production costs in the representative countries (Table 6) and the range of production costs (Table 7), we calculated unit production costs by each type of feedstocks in each country.

Fourth, based on the total production of bioethanol and biodiesel, respectively, in each country, the share of production by feedstocks, and unit production costs by feedstocks, we calculated the costs of biofuels production by country by feedstocks.

Cost components and their corresponding sectors in the GTAP Data Base are listed in Table 15.

Table 15 Cost components and corresponding GTAP sectors

Cost item	Corresponding sector[1]	GTAP code[1]
Feedstocks		
Sugar cane/sugar beets/sugar molasses	Sugar cane and sugar beet	cb
Wheat/rye	Wheat	wht
Rice	Paddy rice	pdr
Corn/sorghum	Other grains	gro
Cassava	Vegetables and fruits	vf
Wine alcohol	Beverages and tobacco products	bt
Soybean oil/animal oils and fats/palm oil/coconut oil/	Vegetable oils	vol
Whey/used cooking oil	Other sectors	os
Chemicals	Chemical and rubber products	crp
Energy: Methanol	Chemical and rubber products	crp
Energy: Heat	Gas distribution	gdt
Energy: Electricity	Electricity	ely
Labor /administration/ maintenance	Labor	
Interest payment/capital recovery costs	Capital	
By-products: animal feeds	Cattle	ctl
By-products: Glycerin	Chemical and rubber products	crp

Note: For sectoral classification and corresponding code, please see the Center for Global Trade Analysis (2008).

7.1 Country-specific feedstocks

Most countries use multiple feedstocks in biofuels production. Feedstocks and the production share by each kind of feedstocks are provided in Table 16. Sectors providing feedstocks and relevant shares in biofuels production are shown in Table 17. The share of imports by type of feedstocks is provided in Table 18. Feedstocks provided by other sectors, such as used cooking oils, are considered from domestic supply.

Four sectors in the GTAP Data Base are identified as corresponding sectors which produce bioethanol. They are sugar (sgr), other foods (ofd), beverages and tobacco products (bt), and chemical and rubber products (crp). Three biodiesel producing sectors in the GTAP Data Base, i.e. other foods (ofd), vegetable oils (vol), and chemical and rubber products (crp), are identified. These sectors are split to generate new biofuels sectors (see Table 19).

Table 16 Major biofuels feedstocks

Country	Bioethanol	GTAP sector code	Biodiesel	GTAP sector code
Australia[1]	Sorghum, wheat and sugarcane	gro, wht, cb	Tallow, used cooking oil and canola	vol, os, vol
Brazil[2]	Sugarcane (100%)	cb	Soybean oil (67%), castor (25%), animal lard and pinhao-manso" (Jatropha curcas) (8%)	vol, vol, vol
Canada[3]	Corn (74.3%) and wheat (25.7%)	gro, wht	Animal fats (68%), recycled cooking oils (31%) and canola (1%) in the future	vol, os, vol
China[4]	Maize (80%), cassava and rice (20%)	gro, vf, pdr	Waste cooking oil and animal fats	os, vol
Columbia[2]	Sugarcane	cb	No production currently.	
EU[2]	Wheat (39%), rye (17%), sugar beets and barley (6%), and wine alcohol (16%)	wht, wht, cb, bt	Rapeseed oils (60-70%), soybean oil (20-30%) and palm oil (10%)	vol, vol, vol
India[5]	Sugar molasses	cb	Jatropha	vol
Indonesia[4]	Sugarcane molasses	cb	Crude palm oil	vol
Japan[2]	Rice (46%), wheat and sugar beets (43%), and other wastes (11%)*	pdr, wht, cb, os	Used cooking oil (currently) and palm oil (from 2010)	os, vol
ROK[4]	No production currently.	-	Soybean oil (70-80%) and recycled cooking oil (20-30%)	vol, os
Malaysia[4]	No production currently.		Palm oil	vol
New Zealand[4]	Whey	os	Tallow	vol
Peru[4]	Sugarcane	cb	Palm oil	vol
Philippines[4]	Sugarcane	cb	Coconut oil	vol
South Africa[5]	Sugarcane, sweet sorghum and maize	cb, gro, gro	Soya oil	vol
Thailand[4]	Sugarcane molasses (86%) and cassava (14%)	cb, vf	Palm oil (almost 100%) and used cooking oil	vol, os
US[4, 6]	Maize (98.7%), wheat (1.3%)	gro, wheat	Soybeans (90%), other fats and oils (10%)	vol, vol
Vietnam[4]	Sugarcane molasses and cassava	cb, vf	Cat fish oil	vol

Source: 1. Biofuels Association of Australia; 2. GAIN (2006b, 2006c, 2007e, 2007f, 2007g, 2008f); 3. Canadian Renewable Fuels Association; 4. APEC (2008); 5. UNCTAD (2006); 6. FAPRI (2009).

Note: Expected ethanol production from 2009.

Table 17 Production share by each type of feedstocks

Country	Bioethanol production share by feedstocks							Biodiesel production share by feedstocks	
	pdr	wht	gro	cb	vf	bt	os	vol	os
Australia		0.3	0.4	0.3				0.5	0.5
Brazil				1				1	
Canada		0.257	0.743					0.69	0.31
China	0.1		0.8		0.1			0.5	0.5
Columbia				1					
EU		0.56		0.06		0.16	0.22	1	
India				1				1	
Indonesia				1				1	
Japan	0.46	0.23		0.2			0.11		1
KOR								0.75	0.25
Malaysia								1	
New Zealand							1	1	
Peru				1				1	
Philippines				1				1	
South Africa			0.5	0.5				1	
Thailand				0.86	0.14			1	
US		0.01	0.99					1	
Vietnam				0.5	0.5			1	

Source: Complied based on Table 16.

Table 18 Import share by different types of feedstocks

Country	Bioethanol feedstocks (%)							Biodiesel feedstocks (%)	
	pdr	wht	gro	cb	vf	bt	os	Vol	os
Australia		1.02	0.00	0.00				10.46	0
Brazil				0.00				3.59	
Canada		7.04	33.90					27.71	0
China	0.00		2.36		1.39			35.82	0
Columbia				0.00					
EU		39.83		0.39		10.42	0	36.22	
India				0.00				1.61	
Indonesia				0.00				19.02	
Japan	0.00	88.44		0.21			0		0
KOR								71.79	0
Malaysia								10.06	
New Zealand							0	27.78	
Peru				0.00				10.00	
Philippines				0.00				45.74	
South Africa			0.46	0.00				39.97	
Thailand				0.00	3.2			14.13	
US		11.86	3.2					11.79	
Vietnam				0.00	9.26			79.31	

Source: Calculated based on the GTAP 7 Data Base.

Table 19 Biofuels producing sectors in the GTAP 7 Data Base

Biofuels	Sector in the GTAP 7 Data Base to be split		Biofuels production sector	
	Definition	Code	Definition	Code
Bioethanol	Sugar	sgr	Ethanol 1	eth1
	Other foods	ofd	Ethanol 2	eth2
	Beverages and tobacco products	bt	Ethanol 3	eth3
	Chemical and rubber products	crp	Ethanol 4	eth4
Biodiesel	Other foods	ofd	Biodiesel 1	die1
	Vegetable oils	vol	Biodiesel 2	die2
	Chemical and rubber products	crp	Biodiesel 3	die3

Country-specific sectoral split schemes are provided in Table 20.

Table 20 Country-specific split schemes and feedstocks

Country	Bioethanol production sector				Biodiesel production sector		
	sgr/eth1	ofd/eth2	bt/eth3	crp/eth4	ofd/die1	vol/die2	crp/die3
Australia		wht, cb	gro			vol	os
Brazil	cb					vol	
Canada		wht, gro			vol		os
China		gro, vf	pdr		vol		os
Columbia	cb						
EU		wht, cb	bt	os	vol		
India	cb				vol		
Indonesia	cb					vol	
Japan	cb	wht	pdr	os			os
KOR					vol		os
Malaysia						vol	
New Zealand				os		vol	
Peru	cb					vol	
Philippines	cb						vol
South Africa	cb	gro				vol	
Thailand	cb			vf		vol	
US		wht, gro			vol		
Vietnam	cb	vf			vol		

7.2 County-specific production costs

Country-specific production costs by type of feedstocks are estimated based on detailed unit production costs in the representative producing countries, i.e. Brazil, the EU and the US in Table 6 and relevant total unit production costs in some countries provided in Table 7. We assume that other countries adopt similar technologies as in the representative producing countries for using the same kind of feedstocks. Therefore differences in the feedstock costs are considered as the only sources of differences in the production costs in different countries (see Table 21).

Table 21 Estimation method for country-specific production costs

Representative country	Biofuels	Feedstocks	Other countries using similar technologies	Note
Brazil	Bioethanol	Sugar cane	Australia/sugar cane, Columbia/sugarcane, India/sugar molasses, Indonesia/sugar molasses, Peru/sugarcane, Philippines/sugarcane, South Africa/sugarcane, Thailand/sugar molasses, Vietnam/sugarcane molasses.	India/sugar molasses, Indonesia/sugar molasses, Philippines/sugarcane, and Vietnam/sugarcane molasses are assumed to have the same unit production costs as Thailand/sugar molasses.
EU	Bioethanol	Wheat	Australia/wheat, Australia/sorghum, Canada/wheat, EU/rye, China/rice, Japan/rice, Japan/wheat, New Zealand/whey, US/wheat.	
EU	Bioethanol	Sugar beet	China/cassava, EU/barley, EU/wine alcohol, Japan/sugar beet, Japan/other wastes, Thailand/cassava, Vietnam/cassava.	Vietnam/cassava is assumed to have the same unit production costs as Thailand/cassava.
US	Bioethanol	Maize	Canada/corn, China/maize, South Africa/maize,	
EU	Biodiesel	Vegetable oil	All other countries which produce biodiesel.	(i) Canada/used cooking oil and Japan/used cooking oil are assumed to have the same unit production costs as Australia/used cooking oil. (ii) China/animal fats and Vietnam/ cat fish oil are assumed to have the same unit production costs as Canada/tallow. (iii) Japan/palm oil, Malaysia/palm oil and Philippines/coconut oil are assumed to have the same unit production costs as Indonesia/palm oil. (iv) New Zealand/tallow is assumed to have the same unit production costs as Australia/tallow.

Table 22 Unit production costs by country by feedstocks (2004 US$/l)

Cost item	GTAP code	Brazil		EU					US			Australia					Canada				China					Columbia
Producing sector		sgr	vol	Ofd	ofd	bt	crp	ofd	ofd	ofd	ofd	ofd	bt	ofd	vol	crp	ofd	ofd	ofd	crp	bt	ofd	ofd	ofd	crp	sgr
Feedstocks	pdr																				0.16					
	Imports																				0					
	Domestic																				0.16					
	wht			0.35					0.35			0.24					0.17									
	Imports			0.139					0.041			0.002					0.012									
	Domestic			0.211					0.309			0.238					0.158									
	gro									0.19			0.24					0.21				0.38				
	Imports									0.006			0					0.071				0.009				
	Domestic									0.184			0.24					0.139				0.371				
	cb	0.13			0.3									0.54												0.13
	Imports	0			0.001									0												0
	Domestic	0.13			0.299									0.54												0.13
	vf																						0.21			
	Imports																						0.003			
	Domestic																						0.207			
	bt					0.3																				
	Imports					0.031																				
	Domestic					0.269																				
	vol		0.41					0.48			0.48				0.29				0.46					0.46		
	Imports		0.015					0.174			0.057				0.112				0.127					0.165		
	Domestic		0.395					0.306			0.423				0.178				0.333					0.295		
	os						0.3									0.22				0.22					0.36	
Chemical inputs	crp		0.03	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02		0.03	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.03	
Energy inputs: methanol	crp		0.03					0.03			0.03				0.03	0.03			0.03	0.03				0.03	0.03	
Energy inputs: heat	gdt			0.05	0.05	0.05	0.05		0.05	0.05		0.05	0.05				0.05	0.05			0.05	0.05	0.05			
Energy inputs: electricity	ely		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Transportation	os	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Labor		0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01
Capital		0.082	0.028	0.296	0.246	0.246	0.246	0.028	0.296	0.055	0.028	0.296	0.296	0.086	0.028	0.028	0.296	0.055	0.028	0.028	0.296	0.055	0.296	0.028	0.028	0.082
Total production costs		**0.235**	**0.531**	**0.759**	**0.659**	**0.659**	**0.659**	**0.601**	**0.759**	**0.358**	**0.601**	**0.649**	**0.649**	**0.659**	**0.411**	**0.341**	**0.579**	**0.378**	**0.581**	**0.341**	**0.569**	**0.548**	**0.619**	**0.581**	**0.481**	**0.235**
By-products: animal feeds	ctl			-0.18	-0.09	-0.09	-0.09		-0.18	-0.07		-0.18	-0.18				-0.18	-0.07			-0.18	-0.07	-0.18			
By-products: glycerin	crp		-0.05					-0.05	0		-0.05				-0.05	-0.05			-0.05	-0.05				-0.05	-0.05	
Net production costs		**0.235**	**0.481**	**0.579**	**0.569**	**0.569**	**0.569**	**0.551**	**0.579**	**0.288**	**0.551**	**0.469**	**0.469**	**0.659**	**0.361**	**0.291**	**0.399**	**0.308**	**0.531**	**0.291**	**0.389**	**0.478**	**0.439**	**0.531**	**0.431**	**0.235**

Source: Compiled based on Table 6 and Table 7.

Table 22 Unit production costs by country by feedstocks (Continued) (2004 US$/l)

Cost item	GTAP code	India		Indonesia		Japan						KOR		Malaysia	New Zealand		Peru		Philippines		South Africa			Thailand			Vietnam		
Producing sector		sgr	ofd	sgr	vol	bt	ofd	sgr	crp	ofd	crp	ofd	crp	vol	crp	vol	sgr	vol	sgr	crp	ofd	sgr	vol	sgr	crp	vol	sgr	ofd	ofd
Feedstocks	pdr					0.93																							
	Imports					0																							
	Domestic					0.93																							
	wht						0.93																						
	Imports						0.822																						
	Domestic						0.108																						
	gro																				0.19								
	Imports																				0.001								
	Domestic																				0.189								
	cb	0.33		0.33				0.3									0.14		0.33			0.23		0.33			0.33		
	Imports	0		0				0.001									0		0			0		0			0		
	Domestic	0.33		0.33				0.299									0.14		0.33			0.23		0.33			0.33		
	vf																								0.23			0.23	
	Imports																								0.007			0.021	
	Domestic																								0.223			0.209	
	bt																												
	Imports																												
	Domestic																												
	vol		0.92		0.31					0.31		0.9		0.31		0.29		0.16		0.31			0.48			0.72			0.46
	Imports		0.006		0.059					0.045		0.646		0.031		0.081		0.016		0.142			0.182			0.102			0.365
	Domestic		0.374		0.251					0.265		0.254		0.279		0.209		0.144		0.168			0.298			0.618			0.095
	os								0.3		0.22		0.76		0.35														
Chemical inputs	crp		0.03		0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03		0.03		0.03	0.02		0.03		0.02	0.03		0.02	0.03
Energy inputs: methanol	crp		0.03		0.03					0.03	0.03	0.03	0.03	0.03		0.03		0.03		0.03			0.03			0.03			0.03
Energy inputs: heat	gdt					0.05	0.05	0.05	0.05						0.05						0.05				0.05			0.05	
Energy inputs: electricity	ely		0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01		0.01	0.01		0.01		0.01	0.01		0.01	0.01
Transportation	os	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Labor		0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01
Capital		0.082	0.028	0.082	0.028	0.296	0.296	0.246	0.246	0.028	0.028	0.028	0.028	0.028	0.296	0.028	0.082	0.028	0.082	0.028	0.055	0.082	0.028	0.082	0.246	0.028	0.082	0.246	0.028
Total production costs		**0.435**	**1.041**	**0.435**	**0.431**	**1.339**	**1.339**	**0.659**	**0.659**	**0.431**	**0.341**	**1.021**	**0.881**	**0.431**	**0.759**	**0.411**	**0.245**	**0.281**	**0.435**	**0.431**	**0.358**	**0.335**	**0.601**	**0.435**	**0.589**	**0.841**	**0.435**	**0.589**	**0.581**
By-products: animal feeds	ctl					-0.18	-0.18	-0.09	-0.09						-0.18						-0.07				-0.09			-0.09	
By-products: glycerin	crp		-0.05		-0.05					-0.05	-0.05	-0.05	-0.05	-0.05		-0.05		-0.05		-0.05			-0.05			-0.05			-0.05
Net production costs		**0.435**	**0.991**	**0.435**	**0.381**	**1.159**	**1.159**	**0.569**	**0.569**	**0.381**	**0.291**	**0.971**	**0.831**	**0.381**	**0.579**	**0.361**	**0.245**	**0.231**	**0.435**	**0.381**	**0.288**	**0.335**	**0.551**	**0.435**	**0.499**	**0.791**	**0.435**	**0.499**	**0.531**

Source: Compiled based on Table 6 and Table 7.

Table 23 Biofuels production by country by feedstocks (ML)

	Brazil		EU					US			Australia					Canada				China					Columbia
Sector providing feedstocks	cb	vol	wht	cb	bt	os	vol	wht	gro	vol	wht	gro	cb	vol	os	wht	gro	vol	os	pdr	gro	vf	vol	os	cb
Producing sector	sgr	vol	ofd	ofd	bt	crp	ofd	ofd	ofd	ofd	ofd	bt	ofd	vol	crp	ofd	ofd	ofd	crp	bt	ofd	ofd	ofd	crp	sgr
Production	17,396	158	1,147	123	328	451	5,095	215	21,263	1,429	19	25	19	100	100	196	566	32	14	556	4,451	556	-	-	272

Table 23 Biofuels production by country by feedstocks (Continued) (ML)

	India		Indonesia		Japan						KOR		Malaysia	New Zealand		Peru		Philippines		South Africa			Thailand			Vietnam		
Sector providing feedstocks	cb	vol	cb	vol	pdr	wht	cb	os	vol	os	vol	os	vol	os	vol	cb	vol	cb	vol	gro	cb	vol	cb	vf	vol	cb	vf	vol
Producing sector	sgr	ofd	sgr	vol	bt	ofd	sgr	crp	ofd	crp	ofd	crp	vol	crp	vol	sgr	vol	sgr	crp	ofd	sgr	vol	sgr	crp	vol	sgr	ofd	ofd
Production	1,411	277	177	241	-	-	-	-	-	-	-	-	148	-	-	16	-	62	-	205	205	-	245	40	-	70	70	-

Source: Compiled based on Table 1, Table 2 and Table 17.

Appendix A Production, Consumption and Trade of Biofuels in Selected Countries

Data provided in this Appendix can be used as references for a comparison with the data provided in Table 1 and Table 2.

Table A.1 Biofuels production by country (2007) (in ML)

Country/Region	Ethanol	Biodiesel	Total
Brazil	19,000	227	19,227
Canada	1,000	97	1,097
China	1,840	114	1,954
India	400	45	445
Indonesia	0	409	409
Malaysia	0	330	330
US	26,500	1,688	28,188
EU	2,253	6,109	8,361
Others	1,017	1,186	2,203
World	52,009	10,204	62,213

Source: Second information from FAO (2008) based on F.O. Licht (2007) and OECD-FAO Aglink-Cosimo database.

Table A.2 Ethanol production, consumption and trade (2005-2008) (in ML)

Country	2005				2006				2007				2008			
	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption
Australia[1]	75.2	n.a.	n.a.	n.a.	605.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Brazil[1]	15,800	0.2	2,600	13,835	17,860	4	3,845	14,204	22,390	1	3,630	18,971	26,700	2	4,800	22,452
Canada[2]	289	n.a.	100	189	372	n.a.	100	272	728	n.a.	0	728	n.a.	n.a.	n.a.	n.a.
EU27[3]	n.a.	n.a.	n.a.	n.a.	1,584	317	38	1,863	1,711	995	44	2,662	2,155	1,267	63	3,359
Indonesia	9	0	7	2	80	0	52	27	767	0	651	116	n.a.	n.a.	n.a.	n.a.
Japan[4]	395	509	23	881	510/0.03	502	0.2	1,012/0.03	458/1.4	469	0.2	926/1.4	n.a.	n.a.	n.a.	n.a.

Note: 1. Data is for marketing year, starts in May and ends in April in the following year; 2. Data includes both fuel ethanol and biodiesel and no official trade statistics exist for either fuel ethanol or biodiesel trade; 3. Data for 2007 and 2008 are estimated; 4. Data indicates the amount used for industry and data after slash indicates additional amount used for transportation; n.a.: not available.

Source: GAIN (2006a, 2007c, 2007h, 2008a, 2008d, 2008f).

Table A.3 Biodiesel production, consumption and trade (2005-2008) (in KL)

Country	2005				2006				2007				2008			
	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption
Australia[1]	104.7	n.a.	n.a.	n.a.	524.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Brazil[1]	0.7	4.8	1.7	3.8	70.1	3.9	3.5	70.5	402.2	3.7	2.5	403.3	1100.0	6.5	1.3	1005.2
EU27[2]	3,360,610	26,459	78,258	3,540,344	5,138,000	155,000	0	5,293,000	6,080,000	852,000	0	6,932,000	6,477,000	1,136,000	0	7,614,000
Japan	0	14,028	0	14,028	6	19,231	0	19,237	6	14,550	0	14,556	n.a.	n.a.	n.a.	n.a.
Malaysia	189,712	73,840	172,672	90,880	369,200	128,368	361,248	136,320	454,400	151,088	550,960	54,528	545,280	147,680	658,880	34,080
Philippines	1	1	0	2	5	1	0	2	35	1	1	30	n.a.	n.a.	n.a.	n.a.
Thailand[3]	94,000	24,000	0	88,000	156,000	0	0	149,000	192,000	0	14,000	172,000	822,000	0	50,000	749,000

Note: 1. Data is for marketing year, starts in May and ends in April in the following year; 2. Data for 2007 and 2008 are estimated; 3. Data includes both biodiesel and bioethanol.

Source: GAIN (2006a, 2007f, 2007k, 2008a, 2008d, 2008f, 2008h, 2008i).

Appendix B Biofuels related trade regimes

Australia

Australia recently placed tariffs on imported ethanol, which can be imported below the cost of local production. The tariff rate, $A 0.38143 cents per liter, is expected to reduce the competitiveness of imported fuel ethanol, particularly from Brazil. However, current tariff protection is scheduled for removal by July 1, 2011. Current tariff protection is scheduled for removal by July 1, 2011(GAIN, 2006a).

Statistics on the trade of fuel ethanol are not available. However, small volumes of ethanol (all types: fuel, industrial, and beverage) were reported as having been exported in 2006 to the Philippines, Japan, Malaysia and Thailand (APEC, 2008).

Canada

There is no tariff on renewable fuels produced in the United States and imported into Canada. However, Canada does have a tariff on ethanol imported from Brazil ($0.05 per liter) (GAIN, 2007c).

Brazil

Brazil is the world's largest exporter of ethanol. A considerable portion of ethanol exports are of high quality ethanol for industrial use (especially exports to Japan and South Korea). Exports for industrial use tend to be fairly stable, while exports of fuel ethanol, with exports to the United States and India being representative, are characterized by irregular flow and the emergence and decline of new markets.

The United States is the largest buyer of Brazilian ethanol when both direct and indirect exports are considered. The US Government's Caribbean Basin Initiative (CBI) exempts imports from the Caribbean from payment of $0.54 per gallon import tariffs, encouraging Brazilian alcohol exports to that region. As a result, recorded exports to destination such as El Salvador, Jamaica, Trinidad & Tobago and Costa Rica are generally destined for the US market.

India emerged several years ago as a top buyer of Brazilian fuel ethanol. Nonetheless, exports to India have fallen over the last two years as India's domestic ethanol production has picked-up (GAIN, 2006b).

For biodiesel, to date no significant exports have occurred. However, Brazil could become a net exporter due to the excess industrial capacity.

Table B.1 Brazilian hydrated alcohol (HS 2207.10) exports by country of destination

(Weight: in MT; volume: in KL; value of FOB: in 1,000 US$ at current prices; price of FOB: US$/l at current prices)

Country	CY 2005[1]				CY 2006[1]				CY 2007[1]				MY 2007/2008[2]			
	Weight	Volume	Value	Price	Weight	Volume	Value	Price	Weight	Volume	Value	Price	Weight	Volume	Value	Price
India	316,094	391,060	110,441	0.2824	-	-	-	-	-	-	-	-	-	-	-	-
United States	184,740	231,203	70,104	0.3032	1,198,006	1,512,287	748,121	0.4947	1,228,535	1,552,001	784,895	0.5057	594,303	749,289	316,439	0.4223
Holland	202,616	248,200	76,720	0.3091	264,087	332,219	146,864	0.4421	314,553	396,380	187,233	0.4724	854,806	1,077,619	454,928	0.4222
Japan	243,061	301,466	89,831	0.2980	179,717	222,408	94,430	0.4246	215,069	266,552	126,318	0.4739	221,692	274,246	105,468	0.3846
Sweden	196,068	245,891	70,102	0.2851	150,788	188,917	74,457	0.3941	173,690	217,838	93,357	0.4286	-	-	-	-
South Korea	174,768	216,217	63,900	0.2955	-	-	-	-	-	-	-	-	73,844	91,314	35,353	0.3872
El Salvador	119,579	157,851	41,888	0.2654	146,155	181,143	80,278	0.4432	159,004	197,031	91,024	0.4620	200,726	248,230	97,619	0.3933
Jamaica	107,803	133,288	40,323	0.3025	105,996	131,036	55,951	0.4270	154,723	191,325	83,071	0.4342	275,228	340,402	136,790	0.4018
Costa Rica	100,101	123,845	37,664	0.3041	73,784	91,265	34,763	0.3809	92,342	114,194	49,003	0.4291	126,123	156,025	61,094	0.3916
Trinidad & Tobago	29,187	36,116	11,348	0.3142	51,134	63,216	30,739	0.4863	91,043	112,629	51,354	0.4560	108,075	133,674	55,306	0.4137
Nigeria	92,330	114,307	34,497	0.3018	34,487	42,680	19,465	0.4561	70,521	87,237	40,274	0.4617	75,538	93,469	35,495	0.3798
Venezuela	38,649	48,878	16,501	0.3376	62,391	78,935	48,800	0.6182	62,391	78,935	48,800	0.6182	-	-	-	-
Others	203,364	253,622	79,217	0.3123	205,099	254,160	103,318	0.4065	226,136	281,180	123,894	0.4406	334,425	417,230	178,592	0.4280
Total	2,008,360	2,501,944	742,536	0.2968	2,471,644	3,098,266	1,437,186	0.4639	2,788,006	3,495,302	1,679,223	0.4804	2,864,760	3,581,498	1,477,084	0.4124

Source: Second information from GAIN (2006b, 2007a, 2008a).

Note: 1. Calendar Year (CY): January - December; 2. Marketing Year (MY): May - April.

Table B.2 Brazilian anhydrous alcohol (HS 2207.20.10) exports by country of destination

(Weight: in MT; volume: in KL; value of FOB: in 1,000 US$ at current prices; price of FOB: US$/l at current prices)

Country	CY 2005[1]				CY 2006[1]				MY 2007[1]				Country	MY 2007/2008[2]			
	Weight	Volume	Value	Price	Weight	Volume	Value	Price	Weight	Volume	Value	Price		Weight	Volume	Value	Price
United States	23,718	29,512	7,359	0.2494	201,366	254,772	134,243	0.5269	204,585	258,845	136,656	0.5279	Jamaica	16,304	20,169	8,147	0.4039
India	15,258	18,876	4,734	0.2508	-	-	-	-	-	-	-	-	Holland	9,171	11,585	4,719	0.4073
Japan	11,226	13,889	3,222	0.2320	-	-	-	-	-	-	-	-	Nigeria	4,209	5,200	2,159	0.4152
Venezuela	472	600	271	0.4517	20,289	25,669	15,898	0.6193	20,140	25,484	15,736	0.6175	El Salvador	4,055	5,015	1,850	0.3689
Sweden	0	0	0	-	10,283	13,023	4,879	0.3746	20,108	25,476	10,216	0.4010	South Korea	3,219	3,979	1,993	0.5009
Jamaica	0	0	0	-	408	507	137	0.2702	16,519	20,541	8,655	0.4214	Philippines	1,478	1,873	701	0.3743
France	0	0	0	-	7,028	8,900	3,909	0.4392	7,028	8,900	3,909	0.4392	United Kingdom	413	523	217	0.4149
Holland	8,878	11,203	2,856	0.2549	11,490	14,396	4,479	0.3111	5,945	7,504	3,180	0.4238	Comoros	294	366	335	0.9153
Trinidad & Tobago	0	0	0	-	6,736	8,363	2,618	0.3130	2,401	2,981	1,238	0.4153	Finland	241	306	114	0.3725
Angola	0	0	0	-	134	166	128	0.7711	134	166	128	0.7711	Singapore	223	282	106	0.3759
South Korea	0	0	0	-	0	0	0	-	106	131	67	0.5115	Others	346	430	367	0.8535
Ivory Coast	0	0	0	-	0	0	0	-	26	32	36	1.1250					
Others	12,582	16,269	4,551	0.2797	3,866	4,799	1,253	0.2611	0	0	0	-					
Total	72,134	90,349	22,993	0.2545	261,600	330,596	167,544	0.5068	276,990	350,060	179,821	0.5137	Total	39,954	49,728	20,707	0.4164

Source: Second information from GAIN (2006b, 2007a, 2008a).

Note: 1. Calendar Year (CY): January - December; 2. Marketing Year (MY): May-April.

Table B.3 Brazilian biodiesel exports by country of destination

(Weight: in MT; volume: in KL; value of FOB: in 1,000 US$ at current prices; price of FOB: in US$/l at current prices)

Country	CY 2005				CY 2006				CY 2006/07[1]			
	Weight	Volume	Value	Price	Weight	Volume	Value	Price	Weight	Volume	Value	Price
Germany	0	0	0	-	1,543	1,753	1,117	0.6370	336	382	598	1.5662
Singapore	728	827	1,102	1.3321	500	568	808	1.4221	190	216	379	1.7554
Argentina	292	332	630	1.8986	456	518	843	1.6268	465	528	1,165	2.2047
US	230	261	665	2.5444	204	232	633	2.7306	88	100	249	2.4900
China	0	0	0	-	99	112	185	1.6444	147	167	226	1.3529
Chile	44	50	143	2.8600	74	84	228	2.7114	80	91	208	2.2880
Peru	12	14	40	2.9333	50	57	158	2.7808	32	36	109	2.9975
Australia	82	93	127	1.3629	43	49	76	1.5554	27	31	54	1.7600
Paraguay	59	67	217	3.2366	38	43	138	3.1958	52	59	215	3.6385
Colombia	21	24	69	2.8914	27	31	89	2.9008	8	9	29	3.1900
Others	49	56	165	2.9633	63	72	253	3.5340	354	402	759	1.8868
Total	1,518	1,725	3,158	1.8307	3,095	3,517	4,529	1.2877	1,780	2,023	3,993	1.9741

Source: Second information from GAIN (2007b).

Note: 1. January-July.

Table B.4 Brazilian biodiesel imports by country of origin

(Weight: in MT; volume: in KL; value of FOB: in 1,000 US$ at current prices; price of FOB: in US$/l at current prices)

Country	CY 2005				CY 2006				CY 2006/07[1]			
	Weight	Volume	Value	Price	Weight	Volume	Value	Price	Weight	Volume	Value	Price
US	1,835	2085	3,549	1.7020	1,134	1289	2,562	1.9882	622	707	1,746	2.4702
Denmark	209	237	244	1.0274	545	619	797	1.2869	168	191	288	1.5086
Mexico	1,115	1267	1,951	1.5398	503	572	1,243	2.1746	316	359	876	2.4395
Germany	310	352	1,206	3.4235	476	541	1,623	3.0005	422	480	1,452	3.0279
Netherlands	46	52	135	2.5826	203	231	667	2.8914	94	107	324	3.0332
Italy	118	134	249	1.8570	134	152	284	1.8651	39	44	100	2.2564
United Kingdom	38	43	126	2.9179	91	103	284	2.7464	46	52	152	2.9078
Finland	41	47	52	1.1161	82	93	117	1.2556	41	47	59	1.2663
Spain	26	30	82	2.7754	61	69	181	2.6112	49	56	110	1.9755
Malaysia	57	65	57	0.8800	49	56	114	2.0474	15	17	31	1.8187
Others	379	431	578	1.3421	107	122	394	3.2404	70	80	246	3.0926
Total	4,174	4743	8,229	1.7349	3,385	3847	8,266	2.1489	1,882	2139	5,385	2.5180

Source: Second information from GAIN (2007b).

Note: 1. January-July; 2. 1 MT biodiesel = 1,136 liters.

Canada

There is no tariff on renewable fuels produced in the United States and imported into Canada. However, Canada has a tariff on ethanol imported from Brazil ($0.05 per liter).

The possibility of significant volumes of ethanol trade, especially between the northwest US and Western Canada (wheat-ethanol to the US and corn-based ethanol to Canada), is unlikely to develop in the short to medium term. This is due mainly to the fact that Canada does not have excess ethanol production capacity. In addition, the transportation, distribution and infrastructure issues around ethanol trade have yet to be resolved. No official trade statistics exist for either fuel ethanol or bio-diesel trade. However, industry statistics suggest that Canadian imports of fuel ethanol are exclusively from the US, and for the 2002-2007 period. These imports have hovered around 70-100 million liters a year (GAIN, 2007c).

In 2007, Canadian exports of denatured alcohol (ethanol that cannot be used for beverages nor for hospital use) was 19 million litres pure alcohol and was destined almost entirely for the US market. Canadian imports of denatured ethanol also increased significantly. However imports of undenatured ethanol dropped in 2007. The drops in undernatured ethanol which can be used for the production of fuel-grade ethanol are likely the reflection of Canada's growing ethanol production capacity (GAIN, 2007c).

Table B.5 Canada ethanol exports (2003-2007) (pure alcohol in KL)

HS code	Description	2003			2004			2005			2006			2007		
		Total	To US		Total	To US		Total	To US		Total	To US		Total	To US	
			Volume	Share		Volume	Share		Volume	Share		Volume	Share		Volume	Share
	Total Ethanol	19,678	17,493	89%	29,340	22,867	78%	35,439	23,703	67%	57,413	40,698	71%	58,683	42,780	73%
220710	Undenatured	8,382	6,965	83%	11,008	9,037	82%	16,606	9,867	59%	19,957	8,460	42%	39,627	27,824	70%
220720	Denatured	11,296	10,528	93%	18,332	13,830	75%	18,834	13,836	73%	37,457	32,238	86%	19,057	19,056	100%

Source: Second information from GAIN (2007c).

Table B.6 Canada ethanol imports (2003-2007) (in 1,000 liters pure alcohol)

HS code	Description	2003			2004			2005			2006			2007		
		Total	From US		Total	From US		Total	From US		Total	From US		Total	From US	
			Volume	Share		Volume	Share		Volume	Share		Volume	Share		Volume	Share
	Total Ethanol	140,012	125,655	90%	156,242	135,463	87%	152,058	113,536	75%	100,325	78,379	78%	553,854	455,412	82%
220710	Undenatured	34,897	21,448	61%	35,993	33,361	93%	29,397	21,809	74%	34,782	26,385	76%	23,095	15,145	66%
220720	Denatured	105,115	104,207	99%	120,249	102,101	85%	122,661	91,726	75%	65,530	51,994	79%	530,759	440,267	83%

Source: Second information from GAIN (2007c).

China

Chinese ethanol exports have been trending up over the last 5 years and jumped dramatically in 2006, in reaction to higher world petroleum prices. In 2006, more than half of China's imports, 4.5 ML, are from itself. This is a result of Chinese production being sent to tariff-free zones and "imported" (GAIN, 2007d). Most exports of ethanol from China are undenatured – principally towards Japan and Korea where it is used for alcohol production. The United States imported substantially more Chinese ethanol in 2006 than in the previous years (APCE, 2008).

However, Chinese ethanol exports in 2007 dropped by 88% from the previous year, as a result of export rebate removal. In 2007, to discourage the expansion of grain-processing sector, the government removed a 13% VAT rebate on ethanol exports. The rebate removal cut profits substantially for ethanol exports. The policy will remain unchanged in 2008 due to rising food price pressure. Partially due to freight advantages to the neighboring markets, Japan, Korea and other Asian countries are predominant export destinations for Chinese ethanol (GAIN, 2008c).

Ethanol imports to China have been relatively minor in recent years. Due to the relative cheaper feed stock for ethanol production in China, imported ethanol is not price-competitive (GAIN, 2007d and 2008c).

Table B.7 China Ethanol Exports by Destination (2003-2007) (in KL)

Country	2003	2004	2005	2006	2007
South of Korea	80,664	16,881	39,144	191,642	50,304
Japan	152,755	49,975	79,375	113,665	35,420
Singapore	15,189	46	5,063	59,923	21,659
Taiwan	26,363	21,909	22,655	41,811	15,592
Korea, North	1,690	6,844	14,648	9,433	5,588
India	83	142	164	46,000	356
Others	7,358	1,115	1,155	555,304	1,055
Total	284,101	96,912	162,204	1,017,779	129,973

Source: GAIN (2008c).

Table B.8 China Ethanol Imports by Origin (2003-2007) (in KL)

Country	2003	2004	2005	2006	2007
Italy	0	0	1	0	220
Japan	1,827	1,900	1,807	1,802	179
United States	31	25	35	149	119
Germany	7	32	31	91	68
Australia	33	1,877	108	66	32
Malaysia	3	0	7	3	16
Netherlands	18	15	7	10	15
Korea, South	24	40	992	29	12
South Africa	0	0	11,610	1,240	6
Singapore	54	35	16	10	5
Others	2,319	327	4,975	4,573	6
Total	4,316	4,253	19,590	7,972	678

Source: GAIN (2008c).

Colombia

Colombia does not currently trade in biofuels, although current production is not meeting total demand. Ethanol imports from the US are levied a 15% duty, while Colombian exports to the US pay 2.5 duty per liter. Under the CTPA (United States-Colombia Trade Promotion Agreement), biofuels import duties between the US and Colombia would be eliminated. Andean Community Countries (CAN) do not pay import duties on ethanol sold to Colombia, although currently there is no trade. Under the CAN-Mercosur agreement, ethanol imports from Mercosur members receive a 12% duty reduction on the base duty (15%), so they pay 13.2%. There are no quotas for importing ethanol into Colombia. Currently Colombian biodiesel imports pay a 10% duty. Under the CTPA, the import duty will be eliminated for imports from the United States once the agreement is implemented (GAIN, 2007e).

European Union

Information on the EU is synthesized based on UNCTAD (2006), GAIN (2006c, 2007f and 2008d).

The EU imported more than 250 million liters of ethanol during the period 2002-2004. About 30% of this volume was imported as normal MFN (Most Favored Nation) trade and subject to specific import duties of € 0.102/l on denatured alcohol (HS 2207.20) and € 0.192/l on undenatured alcohol (HS 2207.10). During the 2002-2004 period, 25% of EU ethanol imports were from Brazil, which are subject to MFN tariffs. The remaining 70% of EU alcohol imports entered under preferential trade arrangements (61% entered duty free and 9% at reduced duty), including the Generalized System of Preferences (GSP, applying to many developing countries), the Cotonou Agreement (for African, Caribbean and Pacific Group of States (ACP)), the Everything But Arms (EBA) Initiative (for Least Developed Country (LDC)), amongst others.

Pakistan, with a 20% share of EU ethanol imports, was the largest exporter under preferential trade arrangements. Other ethanol exporting countries that benefited from EU trade preferences included Guatemala, Peru, Bolivia, Ecuador, Nicaragua and Panama (which benefited from unlimited duty-free access accorded under special drug diversion programmes); Ukraine and South Africa (under the GSP); the Democratic Republic of Congo (under EBA); Swaziland and Zimbabwe (as ACP countries); Egypt (under the Euro-Mediterranean Agreement); and Norway (under special quota).

The new GSP Regulation – which applies from 1 January 2006 to 31 December 2008 – no longer provides for any tariff reduction for either denatured or undenatured alcohol. However, the Regulation includes an incentive scheme for sustainable development and good governance. The scheme provides unlimited and duty-free access to denatured and undenatured alcohol. All countries that already benefited from the previous drug scheme, plus Georgia, Sri Lanka, Mongolia and Moldova, are included in the incentive programme.

Pakistan, one of the most competitive ethanol producers and exporter, lost its privileged status under the GSP in October 2005 and no longer appears to be competitive in the European market. In May 2005 the European Commission initiated an anti-dumping investigation against Pakistan and Guatemala – the largest duty-free exporters over the 2002-2004 period – for dumping of ethanol. The proceedings were officially dropped one year later when the full customs tariff was restored on Pakistani imports.

Duty-free and quota-free access is granted to the LDCs under the EBA Initiative. While exports of ethanol from EBA countries have so far been negligible, new opportunities may emerge in those countries, particularly as a result of increased sugar cane cultivation.

Under the Cotonou Agreement, ACP countries qualify for duty-free access for both denatured and undenatured alcohol. However, imports of ethanol from South Africa, which exported approximately 5 million litres per year to the EU market over the 2002-2004 period, are since 1 January 2006 subject to the full MFN duty. As in other sectors, export performance is often penalized by the graduation of the successful countries from the preferential schemes.

EU imports of biodiesel are subject to an ad valorem duty of 6.5%. Since biodiesel production outside of the EU is still limited, there has been no significant external trade, but there has been considerable intra-European trade. Recent heavy investments in a number of developed (e.g. Australia and United States) and developing countries (e.g. Brazil, India, Indonesia, Malaysia) indicate that these countries are in the process of becoming producers and possibly exporters of biodiesel. International trade of raw materials is growing. To relax pressure on rapeseed oil production, European biodiesel producers have begun sourcing feedstocks from foreign sources. Between 1999 and 2005, EU imports of palm oil (primarily from Malaysia) have more than doubled to 4.5 million tonnes (representing 18% of world palm oil imports).

Data on imports of biofuels into the European Union are difficult to obtain since there is no strictly defined HS code on either bioethanol or biodiesel. A specific customs code for biodiesel (3824 90 91) was only introduced in the EU in January 2008. Prior to this date, biodiesel entering the EU was subsumed under the CN code 38 24 90 98 (other chemicals). Therefore, biodiesel imports are estimated based on industry information. Biodiesel imports are estimated to have surged from 136,000 MT in 2006 to 750,000 MT in 2007 and are expected to further increase in 2008 through 2010. The majority of imports consist of B99 from the US.

As bioethanol has no HS (Harmonized System) code, trade numbers are difficult to assess. Assuming the increase of EU ethanol imports (HS code 2207) since 2002 can solely be attributed to expanding bioethanol imports, EU bioethanol imports are estimated at about 250,000 MT in 2006. During 2007, imports grew significantly to 785,000 MT. The majority of the bioethanol is imported by the UK, Sweden, and the Benelux countries. During 2007, imports from Brazil, Argentina, Costa Rica, Peru, Guatemala, and the US were reported by the Rotterdam port authorities. Although the import statistics are unreliable it is clear that Sweden has imported Brazilian bioethanol for direct blending applications, while imported bioethanol in France and Spain is used for ETBE.

On April 11, 2008, the Dutch and Brazilian Governments signed a Memorandum of Understanding in which the strategic location of the Rotterdam port for the transit of biofuels to the EU is recognized. A part of the bioethanol imports is blended with gasoline in Rotterdam, but most of the biofuels are blended at their final destination to fulfill local Member State (MS) requirements. Brazil mainly exports undenatured, pure ethanol to the EU. The tariff on undenatured ethanol is 192 € per thousand liter, while the tariff on denatured ethanol is 102 € per thousand liter. Most EU MS only permit blending with undenatured ethanol. The UK and the Dutch governments, however, also permit blending with denatured ethanol. As a consequence the UK and Dutch ethanol sectors must compete with the lower priced

denatured ethanol. A part of the ethanol is imported under the HS code 3824 which is subject to a lower tariff, 6.5 % of the customs value.

The bioethanol industry in the EU has had problems to compete with cheap imports of bioethanol. These cheap imports have made it very difficult for the industry to grow strong and manage without subsidies. Most of the cheap imports have come through a loophole in Sweden. Ethanol imported to Sweden could be classified under the "other chemicals" tariff line by mixing the ethanol with 20% gasoline. "Other chemicals" are subject to a lower tariff (about €2.5 per hl) than plain ethanol (€19.2 per hl). Ethanol imported under the "other chemicals" tariff code could also benefit from Swedish tax relief for biofuels. Reportedly, all Swedish ethanol importers took advantage of this loophole. This loophole was closed in January 2006, and there are now an enormous amount of planned bioethanol production plants in the EU.

Brazil's bioethanol sales price varies in the range of €200-300/ton of oil equivalent (toe), compared to about €400/toe for the US and €750-850/toe for the EU. Transport and distribution costs are increasing in Brazil, which adds an extra €150-200/toe. The import duty to the EU adds an additional €300/toe making the costs of Brazilian bioethanol comparable to European production costs.

Table B.9 EU27 biodiesel production, imports, exports and consumption (in ML)

	2005 e	2006 r	2007 e	2008 e	2009 f	2010 f
Production	3,361	5,138	6,080	6,477	8,295	9,773
Imports	26	155	852	1,136	1,364	1,591
Exports	78	0	0	0	0	0
Consumption	3,540	5,293	6,932	7,614	9,659	11,364

Note: r = revised; e = estimate; f = forecast

Source: Second information from GAIN (2007f, 2008d).

Table B.10 EU27 bioethanol production, imports, exports and consumption (in ML)

	2006 r	2007 e	2008 e	2009 f	2010 f
Production	1,584	1,711	2,155	2,535	3,346
Imports	317	995	1,267	1,584	1,774
Exports	38	44	63	63	51
Consumption	1,863	2,662	3,359	4,056	5,070

Note: r = revised; e = estimate; f = forecast

Source: Second information from GAIN (2008d).

India

Although there are no quantitative or SPS (Agreement on the Application of Sanitary and Phytosanitary Measure) restrictions on imports of biofuels, high duties on tariff lines associated with biofuels (see Table A.8) appear to make imports economically unfeasible at this time. The government of India does not

provide any special concessions for imports of biofuels. India does not export ethanol or other biofuels, nor does the government provide any financial assistance for exports of these products (GAIN, 2007g).

Table B.11 India's existing import duty on tariff lines associated with biofuels

HS Tariff Number	Total Import Duty (Percent ad valorem on CIF value)
2207.10 Ethanol denatured	198.96
2207.20 Ethanol undenatured	59.08
3824.90 Chemical products not elsewhere specified	36.82

Source: GAIN (2007g).

Indonesia

Indonesia exports biodiesel in the form of FAME (fatty-acid-methyl-esther), which is to be blended with diesel in the destination country. Most Indonesian exports of biodiesel are to China and other Asian markets. There are also sales to the EU and the US. Crude palm oil (CPO) remains the main trading commodity. Initial trade reports for 2007 indicate that Indonesian exports to China of CPO derivatives are increasing. It is expected that the trend will continue. Indonesian total CPO exports were slowing down in 2007, mainly because of the growth in domestic biodiesel consumption (GAIN, 2007h).

The main export market for Indonesian ethanol is Japan. Ethanol sales to the United States are limited because of competition with Brazil, which has an advantage due to lower freight costs. The future of ethanol export is uncertain, considering the growth of domestic fuel ethanol demand (APEC, 2008).

Table B.12 Indonesia's biofuels production, imports, exports and consumption (in ML)

	Biodiesel			Ethanol	
	2005	2006	2007	2006	2007
Production	9	80	767	46	127
Imports	0	0	0	0	0
Exports	7	52	651	38	114
Consumption	2	27	116	8	13

Source: GAIN (2007h).

Japan

Japan began importing notable amounts of ethanol in 2001, roughly 472 million liters (GAIN, 2006e). Japan imports ethanol, mostly from Brazil and China, to supply its beverage, chemical and pharmaceutical industries. Imports of ethanol for transportation are negligible. Future imports of ethanol for fuel may be possible from Brazil given the joint ventures established between Japanese and Brazilian firms (APEC, 2008; GAIN, 2006e).

ETBE imports are more significant in Japan and have just taken off in the past two years. Prior to 2007 no imports were recorded but, 7.5 ML of ETBE were imported from France in 2007 and 6.7 ML from Brazil forecast for 2008. In addition, 12,800 MT of biodiesel was imported in 2007 (GAIN, 2008f).

The widespread use of ethanol in Japan is somewhat influenced by the import and domestic tax structures. The import tax on crude oil is Y0.17/l. The import duty on alcohol (including ethanol) was 27.2% but starting in FY2006 was lowered to 23.8% and will go down each year until it reaches 10% in 2010. The incremental tax structure for gasoline and ethanol is below. The Government of Japan estimates that inclusive of all taxes, the cost of gasoline is roughly Y123.7/l versus imported ethanol at Y149.7/l (GAIN, 2008f).

Table B.13 Japanese fuel taxes

Fuel	Taxes	Total tax	Average price
Gasoline	Y 0.17/l Import Duty for Crude Oil	Y56.01/l + 5%	Y123.7/l
	Y 2.04/l Petroleum and Coal Tax (paid by refiners)		
	Y 53.8/l Consumer Tax/Gasoline Tax		
	5% Consumer Tax (paid at retail)		
Ethanol	27.2% Import duty for ethanol	27.2% + Y53.8 + 5%	Y149.7/l
	Y 53.8/l Gasoline Tax		
	5% Consumer Tax (paid at retail)		

Note: For exchange rate, $ 1 = Y 116.

Source: Second information from GAIN (2006e).

Table B.14 Japan's ethanol production, imports, exports and consumption (in KL)

	2003	2004	2005	2006	2007	2006	2007	2007	2008*
	Ethanol for Industry Use					Bioethanol for Transportation Use		Bio-ETBE	
Production	330,083	389,375	394,754	509,813	457,518*	30	1,430	0	0
Imports	403,911	494,562	509,161	502,304	468,611	0	0	7,500	6,700
Exports	132	207	22,664	156	193	0	0	0	0
Consumption	733,862	883,730	881,251	1,011,961	925,936	30	1,430	7,500	6,700

Source: Second information from GAIN (2008f).

* Estimated number.

Table B.15 Japan's biodiesel production, imports, exports and consumption (in KL)

	2003	2004	2005	2006	2007
Production	0	0	0	6*	6*
Imports	10,887	14,358	14,028	19,231	14,550
Exports	0	0	0	0	0
Consumption	10,887	14,358	14,028	19,237	14,556

Source: Second information from GAIN (2008f).

* Estimated number.

Republic of Korea

Diesel prices are high due to taxes, including a traffic tax, mileage tax, education tax and value added tax (VAT). According to the Korea National Oil Corporation, taxes on standard diesel fuel account for about 50% of the total price at the pump. Although biodiesel is exempt from the abovementioned taxes, with the exception of the VAT, the price at the pump is the same as standard diesel for two reasons. First, the tax exemption only applies to the proportion of biodiesel, which currently is very small at 0.5% blend ratio. Second, the biodiesel factory price is 300 Korean won more expensive than petroleum diesel (GAIN, 2007i).

Table B.16 Price comparison between diesel and biodiesel (in Korean Won / Liter at current price)

	2005	2006	2007
Factory price (diesel)	560	560	605
Tax (diesel)	410	560	605
Tax-added price (diesel)	970	1,120	1,210
Biodiesel factory price	900-950	900-950	900-950

Source: Second information from GAIN (2007i).

Nearly 70-80% of biodiesel in Korea is produced from imported soybean oil, mainly from Argentina (86%) and the US (14%).

Malaysia

There are currently no import tariffs in Malaysia directly levied on biofuels. There is no import tariff on crude palm oil but there is a 5% duty levied on processed palm oil. There are no duties on two common biofuels feedstocks: rapeseed oil and sunflower oil. There is however a 5% tariff on soybean oil and its fractions (GAIN, 2008h).

Table B.17 Malaysian biodiesel production, imports, exports and consumption (in ML)

	2005	2006	2007	2008
Production	190	369	454	545
Imports	74	128	151	148
Exports	173	361	551	659
Consumption	91	136	55	34

Source: GAIN (2008h).

Table B.18 Malaysian biodiesel imports by country of origin

Country	2006	2007	2006	2007
	Volume (ML)	Percentage (%)	Volume (ML)	Percentage (%)
Singapore	32	25	52	35
Indonesia	20	16	8	5
China	19	15	25	17
Japan	16	13	7	5
Thailand	12	10	14	9
US	7	5	9	6
Germany	3	3	5	3
Taiwan	3	3	3	2
India	3	3	-	-
Republic of Korea	1	1	6	4
Australia	-	-	8	5
Others	9	7	15	10
Total	127	100	151	100

Source: GAIN (2008h).

Table B.19 Malaysian biodiesel exports by country of destination

Country	2006		2007	
	Volume (ML)	Percentage (%)	Volume (ML)	Percentage (%)
Netherlands	131	36	224	41
US	98	27	154	28
India	25	7	27	5
Japan	14	4	15	3
China	11	3	14	2
Germany	9	3	10	2
Republic of Korea	9	3	-	-
Thailand	8	2	10	2
Switzerland	7	2	-	-
Indonesia	7	2	11	2
Australia	-	-	17	3
Singapore	-	-	15	3
Others	43	12	53	10
Total	361	100	551	100

Source: GAIN (2008h).

Peru

Peru plans to produce ethanol and biodiesel for domestic consumption and export. According to the current US-Peru Trade Agreement, Peru would be able to export ethanol tariff-free into the US (APEC, 2008).

The Philippines

CME (HS 3824.90.90) tariffs are currently at 3%, unchanged from the 2006 level. Imports under this tariff heading reached 29.5 MT in 2006 for a slight increase from the 28.9 MT level in 2005. The average price of the 2006 imports was $1,940 per MT, slightly down from the average price of $2,010 the previous year. Exports of 'other chemical products' in 2006, on the other hand, grew 31% from 1,719 MT in 2005 to 2,248 last year, the majority of which were destined for Australia. Average export price per MT was at $1,910, slightly down from the average price in 2005. Chemrez Inc. has exported 500,000 liters of coconut-based biodiesel to Germany and to Asian markets including China, Chinese Taipei, South Korea and Malaysia. If the mandated biodiesel blend increases to 2% in the next two years, as specified in the Biofuels Act, biodiesel companies in the Philippines may concentrate on supplying the domestic market and export only excess volumes (GAIN, 2007k).

For bio-ethanol, tariffs are currently at 1%, by virtue of Executive Order No. 449 issued on July 2005, significant lower than the 10% duty the previous year. The tariff reduction was reportedly to enhance availability of domestic bioethanol supply as well as to encourage oil companies to start making bio-ethanol available at the pump stations. Bio-ethanol, according to the Philippine Tariff Commission, falls under HS 2207.20.11. Trade data, however, only provides information for HS 2207.20.00. Imports under

this heading cover denatured ethyl alcohol and other spirits and reached 11.6 MT in 2006 for a decline from the 18.0 MT level the previous year. The average price per kilo was recorded at $0.60 in 2006, down from the average price per kilo of $0.66 in 20055. Depending on the progress of construction of the projected bioethanol plants required to meet the mandated demand by 2009, bioethanol imports are likely to surge late 2008 to ensure the smooth implementation of the bioethanol component of the National Bio-Fuels Law (GAIN, 2007k).

Exports of denatured alcohol and other spirits reached 252 MT in 2006, significantly down from the 890 MT export level in 2005. Japan was the dominant destination of exported denatured alcohol in 2005 and 2006 with an average export price of $1.25 per kilo and $1.64 kilo, respectively (GAIN, 2007k).

Table B.20 Philippines' biodiesel production, imports, exports and consumption (in ML)

	2004	2005	2006	2007
Production	1	1	5	35
Imports	1	1	1	1
Exports	0	0	1	1
Consumption	2	2	4	30

Source: GAIN (2007k).

Thailand

Thailand does not apply a quota system or other trade barriers to the importation of gasohol and biodiesels. Previously the Government imposed a tariff rate of 2.50 baht/liter (about US$ 0.27 / gallon) on imported ethanol mainly because imported ethanol is used for liquor production. However, in 2005, the insufficient domestic ethanol supplies caused the Government to allow ethanol imports of around 24 million liters duty-free in order to counter an ethanol shortage (GAIN, 2007l).

Meanwhile, fuel ethanol export is expected to grow as the production increases in Thailand. About 14.4 million liters of fuel ethanol was exported in 2007 to Singapore, the Philippines, Chinese Taipei, Australia and Europe due to excess domestic supplies as the plan to replace premium gasoline with gasohol in the beginning of 2007 has been delayed. The Government discourages ethanol exports in order to guarantee sufficient domestic supplies for gasohol production. Most ethanol producers plan to supply ethanol domestically, particularly those who do not have sugar mill businesses, due to concerns over sourcing of raw materials. At the moment, around 350,000 liters have been approved for exports to the Philippines (GAIN, 2007l).

Imports of palm oil are subject to tariff rate quota system with the in-quota tariff being 20 percent (APEC, 2008; GAIN, 2007l).

Table B.21 Thailand's biofuels production, imports, exports and consumption (in ML)

Bioethanol/Biodiesel	2005	2006	2007	2008
Production	94	156	192	822
Imports	24	0	0	0
Exports	0	0	14	50
Consumption	88	149	172	749

Source: GAIN (2007l).

United States

In 2005, the United States imported around 720 million liters of ethanol, representing 5% of domestic consumption. Imports originate mainly from Brazil and reach the US market either directly or via Caribbean countries. The United States imposes MFN import duties of $ 0.1427/l plus a 2.5% ad valorem tariff on fuel ethanol. In many cases, this tariff regime offsets lower production costs in other countries and represents a significant barrier to imports as well as a tool to guarantee a captive market for US ethanol producers (UNCTAD, 2006).

A limited amount of ethanol may be imported duty-free under the CBI even if most of the steps in the production process were completed in other countries. Up to 7% of the US market may be supplied duty-free by CBI ethanol containing no local feedstocks. In this case, hydrous ethanol produced in other countries (mainly Brazil), can be shipped to a dehydration plant in a CBI country for reprocessing. After the ethanol is dehydrated, it is imported duty free into the United States. Dehydratation plants are currently operating in Jamaica, Costa Rica, El Salvador and Trinidad and Tobago (UNCTAD, 2006).

In 2006, the phase-out of MTBE in most fuel markets throughout the member economy resulted in an unprecedented increase in ethanol demand. The Renewable Fuels Association reports that 2,500 million liters of ethanol were imported in 2006, mostly from Brazil, with small volumes from Central America and the Caribbean (Jamaica, El Salvador, Costa Rica, Trinidad and Tobago) (UNCTAD, 2006).

References

APEC, 2008. Accessed at http://www.biofuels.apec.org/ on 21 January 2011.

Biofuels Association of Australia. Accessed at http://www.biofuelsassociation.com.au/ on 21 January 2011.

Bureau of Labor Statistics, United States Department of Labor. CPI Inflation Calculator. Accessed at http://www.bls.gov/data/inflation_calculator.htm on 27 January 2011.

Canadian Renewable Fuels Association. Accessed at http://www.greenfuels.org/en.aspx on 21 January 2011.

Center for Global Trade Analysis, 2008. Global Trade, Assistance, and Production: The GTAP 7 Data Base. Purdue University.

FAO, 2008. The State of Food and Agriculture: Biofuels – Prospects, Risks and Opportunities. Food and Agriculture Organization of the United Nations, Rome.

F.O. Licht (Licht Interactive Data). 2006, 2007. Database of world commodity statistics (available by subscription at www.agra-net.com/portal/home.jsp?pagetitle=showad&pubId=ag083).

Food and Agricultural Policy Research Institute (FAPRI), 2009. U.S. and World Agricultural Outlook. FAPRI Staff Report 09-FSR 1. Iowa State University, Iowa.

GAIN, 2006a. Australia Bio-Fuels: Annual 2006. GAIN Report No. AS6073. Global Agriculture Information Network.

GAIN, 2006b. Brazil Bio-Fuels: Annual 2006. GAIN Report No. BR6008. Global Agriculture Information Network.

GAIN 2006c. EU-25 Bio-Fuels: Biofuels Annual 2006. GAIN Report No. E36122. Global Agriculture Information Network.

GAIN 2006d. India Bio-Fuels: Bio-Fuels Production Report 2006. GAIN Report No. IN6047. Global Agriculture Information Network.

GAIN 2006e. Japan Bio-Fuels: Bio-Fuels Production Report 2006. GAIN Report No. JA6024. Global Agriculture Information Network.

GAIN 2007a. Brazil Bio-Fuels: Annual - Ethanol 2007. GAIN Report No. BR7011. Global Agriculture Information Network.

GAIN 2007b. Brazil Bio-Fuels: Annual - Biodiesel 2007. GAIN Report No. BR7012. Global Agriculture Information Network.

GAIN 2007c. Canada Bio-Fuels: Bio-Fuels Canada 2007. GAIN Report No. CA7041. Global Agriculture Information Network.

GAIN 2007d. China, Peoples Republic of Bio-Fuels: Annual 2007. GAIN Report No. CH7039. Global Agriculture Information Network.

GAIN 2007e. Colombia Bio-Fuels: Annual 2007. GAIN Report No. CO7011. Global Agriculture Information Network.

GAIN 2007f. EU-27 Bio-Fuels: Annual 2007. GAIN Report No. E47051. Global Agriculture Information Network.

GAIN 2007g. India Bio-Fuels: Annual 2007. GAIN Report No. IN7047. Global Agriculture Information Network.

GAIN 2007h. Indonesia Bio-Fuels: Biofuels Annual 2007. GAIN Report No. ID7019. Global Agriculture Information Network.

GAIN 2007i. Korea, Republic of Bio-Fuels: Bio-Fuels Production Report 2007. GAIN Report No. KS7052. Global Agriculture Information Network.

GAIN 2007j. New Zealand Bio-Fuels: Policy, Production and Market Potential 2007. GAIN Report No. NZ7003. Global Agriculture Information Network.

GAIN 2007k. Philippines Bio-Fuels: Annual 2007. GAIN Report No. RP7029. Global Agriculture Information Network.

GAIN 2007l. Thailand Bio-Fuels: Annual 2007. GAIN Report No. TH7070. Global Agriculture Information Network.

GAIN 2008a. Brazil Bio-Fuels: Annual - Ethanol 2008. GAIN Report No. BR8013. Global Agriculture Information Network.

GAIN 2008b. Brazil Bio-Fuels: Annual - Biodiesel 2008. GAIN Report No. BR8014. Global Agriculture Information Network.

GAIN 2008c. China, Peoples Republic of Bio-Fuels: Annual 2008. GAIN Report No. CH8052. Global Agriculture Information Network.

GAIN 2008d. EU-27 Bio-Fuels: Annual 2008. GAIN Report No. E48063. Global Agriculture Information Network.

GAIN 2008e. India Bio-Fuels: Annual 2008. GAIN Report No. IN8063. Global Agriculture Information Network.

GAIN 2008f. Japan Bio-Fuels: Annual 2008. GAIN Report No. JA8038. Global Agriculture Information Network.

GAIN 2008g. Korea, Republic of Bio-Fuels: Bio-Fuels Production Report 2008. GAIN Report No. KS8063. Global Agriculture Information Network.

GAIN 2008h. Malaysia Bio-Fuels: Annual 2008. GAIN Report No. MY8018. Global Agriculture Information Network.

GAIN 2008i. Thailand Bio-Fuels: Annual 2008. GAIN Report No. TH8083. Global Agriculture Information Network.

GoCurrency.com. Historic Exchange Rates. Accessed at http://www.gocurrency.com/v2/historic-exchange-rates.php on 27 January 2011.

IEA, 2002. Biofuels for Transport: an International Perspective. IEA, Paris.

IEA, 2010a. Deploying Renewables in Southeast Asia: Trends and Potentials. IEA, Paris.

IEA, 2010b. Energy Statistics of OECD Countries. International Energy Agency, France.

IPCC, 2007. Climate Change 2007: Synthesis Report. IPCC, Geneva, Switzerland.

Hess, J. R., Jacobson, J. J., Nelson, R., Wolf, C., 2009. International Energy Agency (IEA) Task 40 Sustainable International Bioenergy Trade: Securing Supply and Demand, Country Report-United States. Idaho National Laboratory, INL/EXT-09-16132.

OECD, 2006. Agricultural Market Impacts of Future Growth in the Production of Biofuels. AGR/CA/APM(2005)24/FINAL.

OECD, 2008. Biofuel Support Policies: An Economic Assessment.

OECD, FAO, 2008. OECD-FAO Agricultural Outlook 2008-2017.

Olz, S., Beerepoot, M., 2010. Developing Renewables in Southeast Asia: Trends and Potentials. IEA Working Paper, France.

Smeets, E., Junginger, M., Faaij, A., 2005. Supportive Study for the OECD on Alternative Developments in Biofuel Production across the World. Report NWS-E-2005-141.

Steenblik, R., 2007a. Biofuels – At What Cost? Government Support for Ethanol and Biodiesel in Selected OECD Countries. International Institute for Sustainable Development, Geneva.

Steenblik, R., 2007b. Subsidies: The Distorted Economics of Biofuels. Discussion Paper No. 2007-3. International Institute for Sustainable Development, Geneva.

Taheripour, F., Birur, D. K., Hertel, T. W., Tyner, W. E., 2008. Introducing Liquid Biofuels into the GTAP Data Base. GTAP Research Memorandum No.11 (Revised).

UNCTAD, 2006. The Emerging Biofuels Market: Regulatory, Trade and Development Implications. UNCTAD, Geneva.

Valin, H., Dimaranan, B., Bouet, A., 2009. Biofuels in the World Markets: A Computable General Equilibrium Assessment of Environmental Costs Related to Land Use Changes. CATT WP No. 6. Accessed on 22 December 2010 at http://catt.univ-pau.fr.

Walter, A., Calle, F. R., Dolzan, P. B., Piacente, E., Da Cunha, K. B., 2007. Market Evaluation: Fuel Ethanol. Task 40 Sustainable Bio-energy Trade: Securing Supply and Demand. IEA Bioenergy.

Walter, A., 2009. IEA Bioenergy Task 40, Country Report: Brazil. UNICAMP, Brazil.

Whims, J., 2002. Corn Based Ethanol Costs and Margins, Attachment 1, AGMRC, Kansas State U., at http:www.agmrc.org.corn/info/ksueth1.pdf.