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International biodiesel markets

Developments in production and trade

German Union for the Promotion of Oils and Protein Plants

Patrick Lamers

ECOFYS

Table of contents

Author's institution and contact information:

A: Ecofys Germany GmbH
Am Karlsbad 11
10785 Berlin
Germany

E: p.lamers@ecofys.com

M: +49 (0)17 35 35 67 21

@: www.ecofys.com

imprint

editor:
German Union for the Promotion of Oils
and Protein Plants (UFOP)
Claire-Waldoff-Str. 7
10117 Berlin
Fon: +49 (30) 3 19 04-2 02
Fax: +49 (30) 3 19 04-4 85
info@ufop.de
www.ufop.de

1. Introduction

The global biodiesel market has shown an exponential growth in production and trade across the past decade. Nowadays, more biodiesel than ever before is sourced from abroad and procurement areas – especially of large scale producers and traders – span the globe. While this trend is bound to continue, markets and trade developments are still strongly linked to support and trade policies. Furthermore, the biodiesel industry is strongly linked to other sectors (agriculture and mineral oil industry in particular) and faces significant market disturbances some of which have led to various inefficiencies in the past. Due to the pace of this market development, a methodological assessment and understanding of the numerous influencing factors was needed to reduce uncertainties and risks for those involved. A recently published analysis by Ecofys and the Copernicus Institute, Utrecht University (see Lamers et al. [1]) provided such an analysis. It evaluates how the interaction of domestic policies steered global trade streams towards different markets, in particular in connection to underlying trade policies and additional market forces, over the past decade. It provides robust data on international production and trade volumes which have already served as input to the recently published Special Report on Renewable Energy (SRREN) by the Intergovernmental Panel on Climate Change (IPCC) [2]. This market brochure was commissioned by UFOP to build upon the methodologies and findings of Lamers et al. [1] and to provide a picture of the global biodiesel market in 2010/2011. It is structured in six sections: an overview of global production volumes (Section 2); developments of EU (Section 3) and other world (Section 4) markets and (trade) policies; global net trade volumes (Section 5); vegetable oil trade patterns and their link to biodiesel trade (Section 6); Conclusions and Outlook (Section 7).

2. Global production volumes

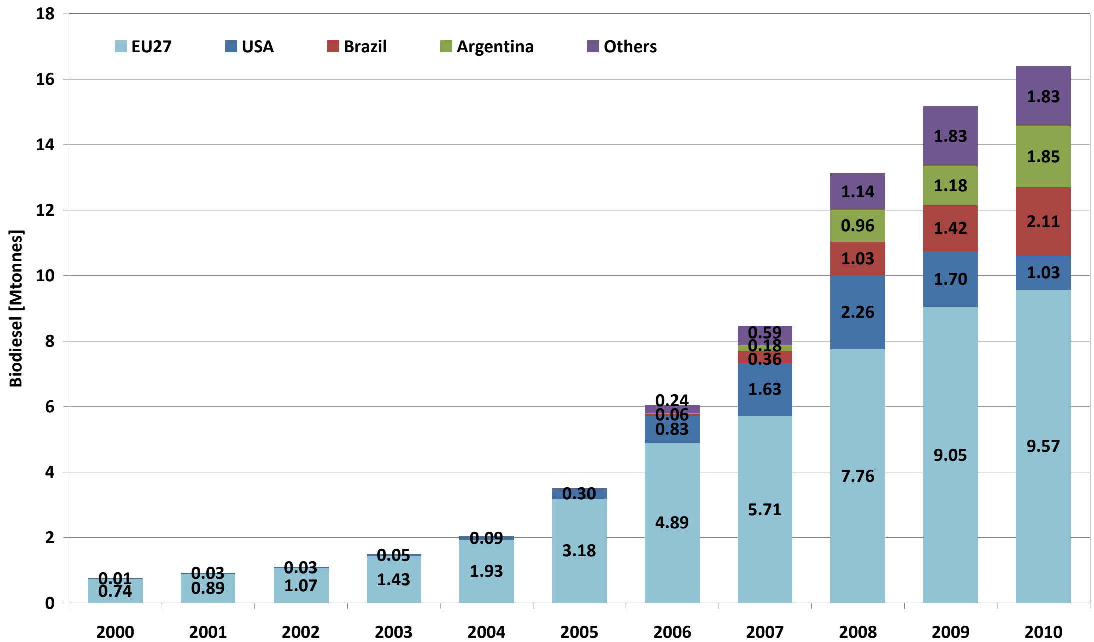

Figure 1. Development of world biodiesel production between 2000-2010 [Mtonnes]. *Source: boxed grey in Table 1; methodology for data selection as in [1].*

As shown in Figure 1, global biodiesel production grew exponentially from less than 1 Megatonne (Mtonne) in 2000 to over 16 Mtonnes in 2010. Data for this comparison has been derived from a myriad of sources; compared against each other in Table 1. Where possible, industry data was chosen over other e.g. government sources (see Lamers et al. [1] for a detailed description of the data selection process).

Clearly, the EU has dominated world production. Its continuous production growth though can only be partly attributed to its extensions in the number of its Member States since the core EU biodiesel production centers are Germany and France; followed by Spain, Italy, and Poland. Many governments around the world have implemented national biodiesel production and consumption targets over the past years. A large amount of recent production growth (e.g. Argentina, Indonesia) however can be linked to exports to the EU. An exception to this is Brazil whose production is merely consumed nationally and grew by 50% in 2009/2010. The market developments of biodiesel are inherently different to those for fuel ethanol (see Lamers et al. [1] for a comparison) and primarily connected to the different transport fuel demands; biofuel and agricultural policies of the respective countries/regions; and interests of the respective market players.

Table 1. World biodiesel production 2000-2010 in Mtonnes.
Source: [1] plus literature update for 2010.

	Sources	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
USA	REN21 [3]						0.22	0.75		1.76	1.85	1.06
	EIA [4]		0.03	0.03	0.05	0.09	0.30	0.83	1.63	2.26	1.70	1.03
	IEA [5]	0.01	0.02	0.05	0.07	0.08	0.25					
	USDA [6]										1.83	
	AREC [7]									2.32		
Brazil	REN21 [3]							0.06		1.06	1.41	2.02
	ANP [8]						0.00	0.06	0.36	1.03	1.42	2.11
	USDA [9]						0.00	0.06	0.36	1.03	1.35	
EU27	REN21 [3]						3.17	3.96		7.04	7.83	
	EBB [10]			1.07	1.43	1.93	3.18	4.89	5.71	7.76	9.05	9.57
	IEA [5] [a]	0.74	0.89	1.05	1.49	1.91	3.25					
	USDA [11]							4.72	6.00	7.76	8.46	
	Eurostat [12]						3.10	5.30	6.83	7.91		
Argentina	REN21 [3]									1.06	1.23	1.85
	FO Licht [13]							0.03	0.25	0.80	1.30	
	AREC [7]									0.96		1.90
	USDA [14]							0.02	0.18	0.76	1.18	1.85
Thailand	REN21 [3]									0.35	0.53	0.53
China	REN21 [3]							0.06	*0.07*	0.09	0.35	0.18
Colombia	REN21 [3]							0.05	*0.11*	0.18	0.18	0.26
Malaysia	USDA [15]									0.20	0.22	0.08
	FO Licht [13]							0.05	0.10	0.19	0.24	
Indonesia	Dillon et al. [16]									0.73		
	REN21 [3]											0.62
	FO Licht [13]							0.05	0.25	0.23	0.37	
	USDA [17]						0.01	0.07	0.10	0.09	0.08	0.40
Others [b]	*Sum* [c]						*0.01*	*0.21*	*0.53*	*1.04*	*1.67*	*1.66*
	Calculated upper value [d]						*0.36*	*1.31*	*1.12*	*3.81*	*4.13*	*2.25*
	Total emerging markets [e]	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.24*	*0.59*	*1.14*	*1.83*	*1.83*
WORLD	REN21 [3]						3.43	5.28		10.56	14.96	16.73
	FO Licht [18]	0.80	0.95	1.15	1.60	2.05	3.40	6.00	8.80	13.00	13.30	
	LMC [19]						3.20	6.10	9.00	14.40	16.20	
	IEA [5]	0.75	0.92	1.12	1.59	2.04	3.68	4.31				
	Total [f]	***0.75***	***0.92***	***1.10***	***1.48***	***2.02***	***3.50***	***6.04***	***8.47***	***13.14***	***15.18***	***16.39***
	Minimum [g]	*0.74*	*0.91*	*1.09*	*1.48*	*1.99*	*3.33*	*5.02*	*8.47*	*11.73*	*13.90*	*16.31*
	Maximum [g]	*0.74*	*0.92*	*1.12*	*1.55*	*2.03*	*3.56*	*6.46*	*9.65*	*13.49*	*15.44*	*16.42*

a: original data source: European Biodiesel Board (EBB)
b: category covers emerging biodiesel producing nations apart from US, EU, Brazil, Argentina
c: sum of grey boxes for Thailand, China, Colombia, Malaysia, and Indonesia only
d: maximum level of production in emerging markets; calculated as the maximum world production minus minimum individual country data for US, EU, Brazil, Argentina; the actual calculated value for 2004 is zero whereas earlier years showed values up to 0.02 Mtonnes, those however were neglected as they are attributed to data variations for total world production and no biodiesel production outside the US and the EU is known for this period.
e: reflects the sum of production in Thailand, China, Colombia, Malaysia, and Indonesia plus a 10% uncertainty factor
f: sum of all selected data as boxed grey
g: sum of all minimum/maximum annual data from US, EU, Brazil, Argentina plus data ‘Total emerging markets’

3. European Union

3.1. *Markets and policies*

In the EU, local biofuel production has largely been focused on biodiesel as conventional diesel has been the dominating fuel in final road transport consumption over the past decade (see e.g. Eurostat data in [20]). This development was particularly driven by the introduction of indicative biofuel targets in 2003 via the EU-directive on the promotion of the use of biofuels or other renewable fuels for transport (2003/30/EC). It triggered initiatives on Member State (MS) level to promote biofuels via tax exemptions or as a blend component in fossil fuels. The tax exemptions were guard railed via the EU Energy Tax Directive (2003/96/EC): MS had to prove annually the so-called 'over compensation' and tax exemption levels had to take into account raw material price changes to avoid additional costs for manufacturers**.** Most of the tax incentives in the EU have been aimed at final consumption i.e. partial or total tax exemptions for biofuels at the pump.[1] Because the tax exemption given to biofuels must not exceed the level of the respective MS' fossil fuel tax, the instrument has proven most successful in EU MS with fossil fuel tax levels high enough to compensate for the additional production costs of biofuels [21, 22]. Over the years, especially after 2008, biofuel blending mandates have accompanied or even replaced tax exemptions across the EU. By 2010, 18 MS had a mandate in place – 16 of which also provided tax exemptions.[2] This shift can largely be attributed to a previous loss in fuel tax revenues for MS, causing a stepwise reduction of tax exemptions and a compensation via mandates; but partly also to providing long(er)-term targets thus enhancing the predictability of market developments and reducing investment risks. The current target, a 10% renewable energy share in final energy consumption by 2020 is covered under the Renewable Energy Directive (2009/28/EC). National blending levels though are limited by transport fuel norms (see [23, 24]).

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[1] The development of the EU biofuel market and policies can be observed via the individual Member State reports to the European Commission, available under: http://ec.europa.eu/energy/renewables/biofuels/ms_reports_dir_2003_30_en.htm

[2] Obviously, there are also complementary policies to promote biofuels across the EU such as direct support for producers, investment subsidies, or R&D programs (see Mitchell et al. [22] for an overview of policy instruments to stimulate renewable energy in transport).

The largest increase in production capacity across the EU could be observed along the North Sea and connected inland waterways, especially in France, Benelux, Germany and the UK. This is primarily linked to historic structures of oilseed handling and crushing companies (e.g. ADM, Bunge, Cargill) which have installed biodiesel facilities next to their vegetable oil mills. Over the years, this trend has made many European harbors, e.g. Antwerp in Belgium, Rotterdam/Amsterdam in the Netherlands (connected with biofuel plants along the Rhine river), or Hamburg in Germany strategic biofuel hubs that deal with the import, crushing, production, blending and re-export of biofuels and their feedstock. Even though they also (re-) export globally, they are primarily a European entrance gate for international biofuels.

While EU biodiesel production almost doubled since 2006, the underlying production capacity more than tripled reaching about 22.12 Mtonnes in 2011 [10]. The gap between production output and capacity results in a capacity utilization drop from around 81% in 2006 to about 43% in 2010 [1]. Lamers et al. [1] list a number of potential reasons for this overcapacity: very attractive market settings at the time of investment decisions and construction start under low competition from overseas biodiesel imports; policy modifications over time; a relatively slower consumption increase – partly related to sustainability concerns; and economic viability constraints due to a widening gap between biodiesel prices (related to fossil fuel prices) and production costs (related to feedstock prices). This overcapacity has already lead to a consolidation within the EU biodiesel industry; increasing competition has especially impacted smaller, less vertically integrated (potentially less efficient, more remote, etc.) biodiesel plants e.g. in Germany, Austria, and the UK (see e.g. USDA [25]).

Key biodiesel producer in the EU over the last decade has been Germany [10, 12]. Reasons for the strong German market growth included tax exemptions for low and also neat biodiesel blends; early investment support provided on state level (after 1990 in the new, former GDR states); amortised plants; existing know-how and infrastructure regarding rapeseed oil production and processing. German production (and consumption) levels though dropped significantly after the introduction of the 2007 German Biofuel Mandate. Primarily, the mandate was a compensation for the stepwise decline in tax exemptions for B100. Without tax exemptions, neat biodiesel was not price competitive against fossil diesel – even though the price of fossil diesel increased (see UFOP [23, 24] for details on the German market and policy developments). Until today, the often contractual price links (on global commodity markets) between vegetable oils and fossil fuels remain one of the key issues of biodiesel industry.

3.2. *Trade developments*

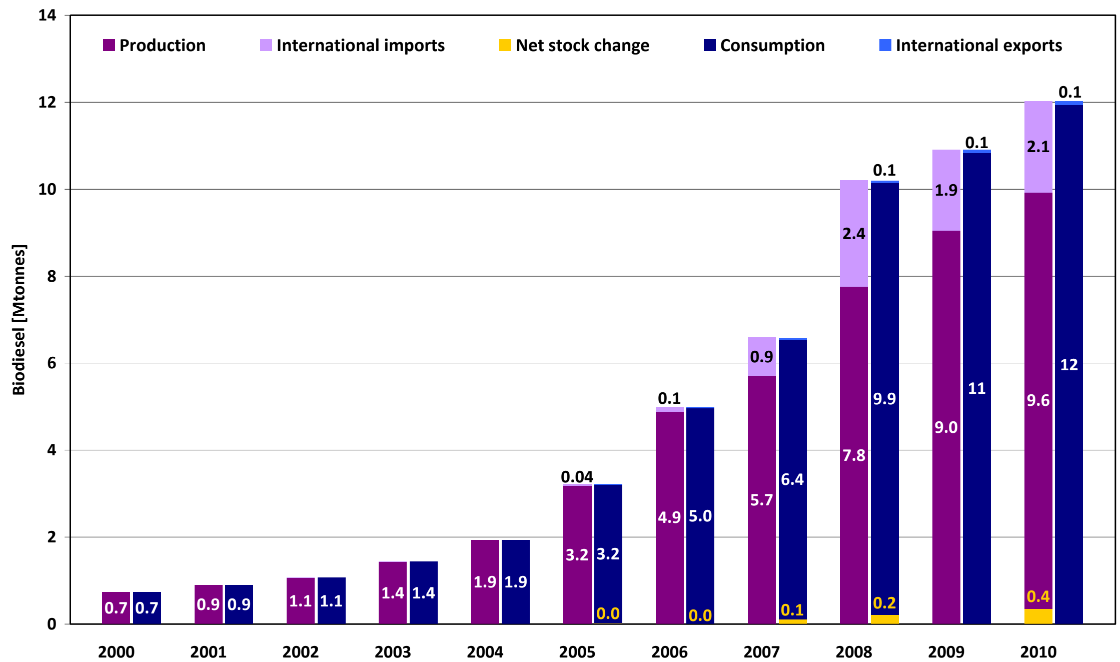

Figure 2. EU biodiesel trade balance 2000-2010 (extra-EU only) [Mtonnes].[3]
Source: [1] plus additional calculations for 2010
Data: [5, 10, 12, 26-29]

Under a mandate, fuel suppliers will naturally tend to opt for blending low cost biofuels (see discussion in Wiesenthal et al. [21]). Therefore, the shift from tax incentives to mandates across Europe has been one of the key reasons for the growing amount of biodiesel imports (primarily based on soy or palm oil). Also, the growing conversion capacity in European harbors (and connected inland waterways) allowed biodiesel production based on diverse and potentially cheaper international biofuels/feedstock. The EU biodiesel trade balance (see Figure 2) clearly shows an increasing share of

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[3] Eurostat [12] also offers a complete trade balance which includes intra-EU trade. To derive international trade data only, additional sources were used. Due to down-blending before customs and imports under other trade codings (e.g. 'Other chemicals'), EU biodiesel imports (i.e. FAMAE under CN 3824.90.91) as under Eurostat [24] show lower numbers (see Table 2) than EU imports combined with US export data.

competitively priced, extra-EU imports. Obviously, the import volumes differ between EU MS in terms of EU-internal and international trade (see Eurostat [12, 28] for details).[4] Biodiesel supply in the Netherlands, the UK, Spain, Portugal, and Italy is covered to a large extent by EU-external imports whereas those are marginal in the French or German biodiesel trade balance [12, 28]. The Netherlands, due to its large fossil fuel refining capacities in Rotterdam and Amsterdam, is the largest biofuel distribution place in Europe. In recent years, imports from Argentina at prices below production costs in Spain and Portugal have troubled the biodiesel industry in these markets. The UK has traditionally had a liberal trade policy and limited domestic biodiesel production. The Italian biodiesel policy demands an EU-wide tender procedure which puts domestic production in an EU-wide price competition. France at the same time only requires a restricted tender which has so far limited imports. Existing oilseed crushing capacity and production cost reductions via feedstock imports (e.g. rapeseed from Poland) have safeguarded German biodiesel production against competition from imports.

EU-internal trade of biodiesel (i.e. FAME under CN 3824.90.91) rose from 2.06 Mtonnes in 2008 to 3.74 Mtonnes in 2010 [28]. Over 40% of the trade originated in the Netherlands and close to 16% in Belgium in 2010; most of which is assumed to be primarily international imports. 18% of the volume was of German origin – most of which is assumed to be local production.

Table 2 presents the portfolio of international EU biodiesel imports (based on [28]). Unsurprisingly, the trade flows are influenced by the underlying tariff regimes: US imports dominated until (March) 2009 and were replaced by imports from Argentina, Indonesia, Canada, and Singapore. The EC launched an investigation of biodiesel imports from Canada and Singapore by late 2009 – claiming that they are actually of US origin (see Section 4). The respective trade streams declined in 2010. Imports from/via India however have neither faced such an investigation nor import duties and saw a continuously growth across 2009 and 2010 (see Table 2).

[4] The specific trade differences between EU-internal and external trade depend on policies, prices, infrastructure, market interests, and other factors and are too numerous to be dealt with within the scope of this article.

Table 2. Third country EU imports and tariffs (ad valorem) of biodiesel (CN 3824.90.91) in 2008-2011 [ktonnes].
Source: [1, 28, 30] if not indicated otherwise

	2008	2009	2010	2011*	Tariffs 2008	Tariffs as of July 2009	Tariffs as of May 2011
United States	1,488	381	0.6	0.1	6.5%	ADD, CVD [a]	ADD, CVD [a]
Argentina	77	854	1,179	1,245	0.0%	0.0%	0.0%
Canada [b]	0	140	90	2	6.5%	6.5%	ADD, CVD [b]
Indonesia	155	158	496	895	0.0%	0.0%	0.0%
Malaysia	38	123	78	10	0.0%	0.0%	0.0%
India	0	25	37	50	0.0%	0.0%	0.0%
Singapore	0	20	12	0	6.5%	6.5%	6.5%
Norway	2	3	6	54	6.5%	6.5%	6.5%
Others	20	7	27	13			
Total [c]	**1,780**	**1,711**	**1,927**	**2,270**			
US exports to EU [d]	2,153	524	172	138			
Estimated actual EU imports [e]	**2,445**	**1,854**	**2,098**	**2,408**			

* extrapolation based on first two quarters in 2011
a: ADD: Anti-dumping duties of 68.60 to 198 €/tonne depending on company;
CVD: Countervailing duties of 211.20 to 237 €/tonne depending on company
b: ADD: Anti-dumping duties of 172.20 €/tonne
CVD: Countervailing duties of 237 €/tonne
c: As under Eurostat [28, 30]
d: USDA [29] data for commodities under HS 3824.90.40.00
e: US exports to EU [29] plus EU imports from other third countries [28]

It is noteworthy that Eurostat [28] data as presented in Table 2 does not cover all EU biodiesel imports. First, Eurostat only published data for trade codes up to 8-digit-level [31], and secondly, the EU trade code for fatty-acid methyl ester (FAME) only covers blends of 20% biodiesel content and higher. This is not consistent across international trade codes. The US code e.g. includes concentrations of 30% biodiesel content or higher. Lamers et al. [1] calculated trade information gaps between 119 to 663 ktonnes. This appears to justify European Biodiesel Board (EBB) claims on suspected practice of US B99 shipments to EU harbors, down-blending to B19 outside customs, and a following declaration of B19 import.

4. Other regions: markets, policies, and trade developments

4.1. *United States of America*

The EU anti-dumping and countervailing duties put upon US biodiesel imports since March 2009 were originally aimed at counteracting the so-called ‘splash-and-dash’ practice or ‘B99’ effect. It was based on the volumetric excise tax credit (VETC) for biodiesel blended with fossil fuel – established in 2004 by the US Congress (see Table 3). However, the VETC was neither linked to domestic production nor domestic consumption and could therefore also be collected for imports/exports. Hence, it was possible to import biodiesel to the US from a third country (e.g. from Europe or Argentina), claim the US tax credit and re-export the product. This practice was commonly known as 'splash-and-dash'. Re-exports[5] exclusively went to the EU zone where the biodiesel would receive a second financial incentive through many MS's support schemes. The term 'B99 effect' came from the fact that the definition of 'blending' made it possible to receive the credit by adding a mere 0.1% of mineral oil resulting in trade of B99.9 biodiesel.

Table 3. Summary overview of US and EU subsidies, tariffs, and duties [€]

US Volumetric Excise Tax Credit	€/liter	€/tonne
(Fuel) Ethanol	0.102	129
Biodiesel (agricultural origin)	0.200	227
Biodiesel (waste oil)	0.100	114
EU average of maximum support levels within individual MS		
(Fuel) Ethanol	0.283	359
Biodiesel	0.228	259
US import tariffs and taxes		
Import duty undenatured ethanol (2.5% ad valorem) [b]	0.010	12
Import duty denatured ethanol (1.9% ad valorem) [b]	0.007	9
Import tax (un)denatured ethanol	0.108	137
Import duty biodiesel (4.6% ad valorem) [c]	0.029	33
EU import tariffs, ADD and CVD		
Import duty undenatured ethanol	0.192	243
Import duty denatured ethanol	0.102	129
Import duty biodiesel (6.5% ad valorem) [c]	0.040	46
Minimum anti-dumping duties on US biodiesel	0.060	69
Maximum anti-dumping duties on US biodiesel	0.174	198
Maximum countervailing duties on US biodiesel	0.209	237

a: own calculations based on EU MS reports (see http://ec.europa.eu/energy/renewables/biofuels/ms_reports_dir_2003_30_en.htm)
b: assumed international fuel ethanol price: 0.5136 US$/liter
c: assumed international biodiesel price: 0.8222 US$/liter

The quantities of this trade can be observed from Table 4. Argentinean exports to the US increased sharply in 2008 – the prime phase of the B99 effect – but dropped again in 2009 (under EU counter duties). This pattern is also true for Indonesia and Singapore (a major hub for palm oil derived FAME). The data however cannot confirm claims regarding a significant EU-US-EU biodiesel splash-and-dash trade flow.

[5] Re-exports are defined as exports of previously imported commodities.

Table 4. US imports and tariffs (ad valorem) of biodiesel (HS 3824.90.40.20) in 2006-2010 [ktonnes].
Source: [1, 29, 32]

	2006	2007	2008	2009	2010	Current Tariffs
Canada	8.3	17.3	59.0	67.4	35.0	0.0%
Malaysia	54.3	130.5	64.8	77.2	3.5	4.6%
Indonesia	25.6	186.0	280.1	12.5	0.1	4.6%
Argentina	0.0	40.9	540.6	83.8	0.0	4.6%
Singapore	3.1	32.6	102.3	9.8	0.0	0.0%
European Union-27	10.3	7.6	9.8	7.0	5.7	4.6%
Others	54.3	72.1	36.6	10.8	0.9	
World Total	**156**	**487**	**1,093**	**269**	**45**	

The VETC was extended until the end of 2009. The splash-and-dash practice though was practically closed by limiting the credit to biodiesel with connection to the US. Ultimately though, US-produced biodiesel could still receive the credit, be exported to Europe and be eligible for European tax exemptions. Therefore, the EC imposed anti-dumping and countervailing duties on US imports – effective as of July 2009 under the Regulations 598/09 and 599/09 [33, 34], which reduced direct US imports significantly (see Figure 3). Traders though started triangular trade e.g. via Canada; potentially also via Singapore and India given their marginal production but large shares in EU imports in 2009 (see Table 2). A formal investigation of this issue was launched by the EC in August 2010 following a complaint from the EBB [35]. It lead to an extension of US-focused anti-dumping and countervailing duties, and the creation of such measures against imports from Canada.

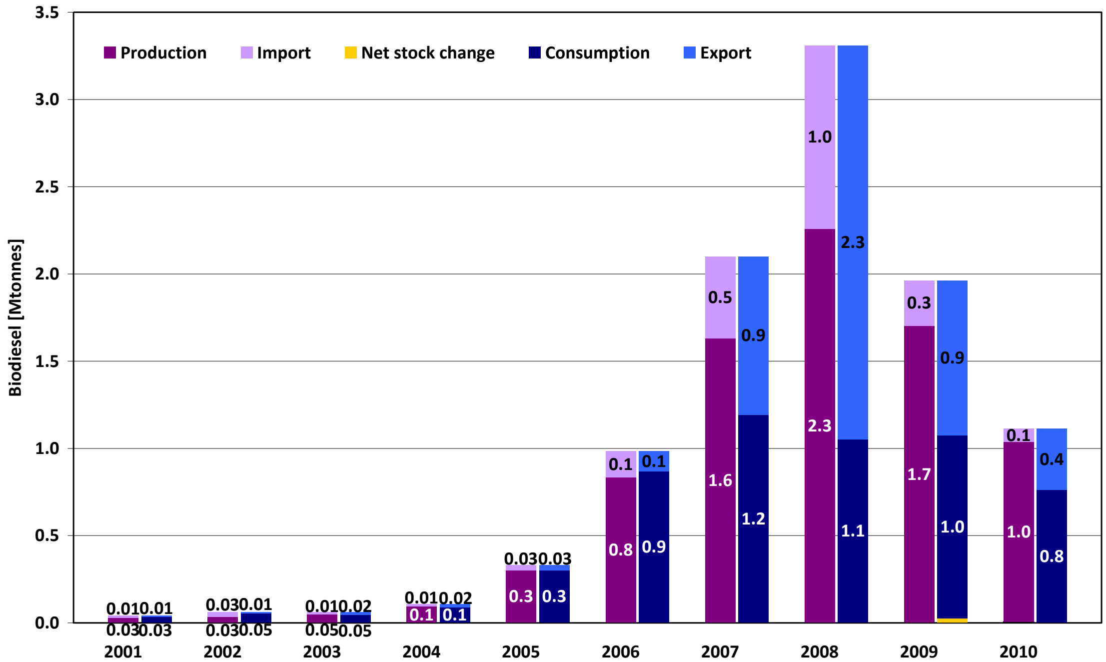

Figure 3. US biodiesel trade balance 2000-2010 [Mtonnes].
Source: [1, 4, 29]

4.2. *Argentina*

As one of the world's largest vegetable oil producers, yet a net mineral oil importer, Argentina had a strong national interest to promote biodiesel production. Currently, it foresees blending rates of B7 which are said to increase to B10 soon [14]. Supply for the local biodiesel market is characterized by small-scale, distributed production. Large-scale producers in strategic harbor locations focus exclusively on selling to export markets, ever since the early stages of the national biodiesel industry in 2006 (see [36] for a detailed market analysis). In order to maintain low internal food prices, Argentina applies export duties to agricultural products. This measure was undertaken after the food crisis following the economic downturn in Argentina in 2002/2003. Export taxes for processed (inedible) products are lower, thus giving an advantage to biodiesel over pure vegetable oil exports [36]. It is estimated that the price advantage lies between 140-150 € per tonne of soybean oil derived methyl-ester as compared to crude soybean oil exports. Biodiesel exports leave Argentina exclusively for Europe [7]. Based on official statistics [14, 28], 64-73% of the 2010 production was exported to the EU. This still leaves room for additional imports e.g. via downblending to B19 i.e. under the EU trade code limit. EU imports of Argentinean biodiesel are expected to reach record levels in 2011 (see Table 2). 2012 production estimations for Argentina state 2.6 Mtonnes by 2012 [14].

4.3. *Indonesia and Malaysia*

The world's largest crude palm oil producers, Indonesia and Malaysia, have started to play an important role in international biodiesel trade. Despite data discrepancies between various sources (see Table 1), it is clear that biodiesel production in both countries is mainly destined for export to the US and the EU (see Table 5). While both, Indonesia and Malaysia, have a B5 blending target, local consumption yet only plays a minor role.

Table 5. Biodiesel production and export from Malaysia and Indonesia vs. US and EU imports in 2006-2010 [ktonnes].

	2006	2007	2008	2009	2010
Malaysia					
Production (see Table 1)	50	100	190	240	80
Exports [a]	48	95	182	228	90
US and EU imports from Malaysia [b]	54	131	103	200	82
Indonesia					
Production (see Table 1)	50	250	230	370	620
Exports [c]	37	0	0	176	207
US and EU imports from Indonesia [a]	26	186	435	171	496

a: MPOB [37-39]
b: Trade data as reported by USDA [29] and Eurostat [28]
c: USDA [17]

Comparing production outputs, only Indonesia was able to maintain a steady growth. It is claimed that this is largely due to the lack of local subsidies for the Malaysian biodiesel industry without which it cannot compete with fossil diesel on the local market or international competition in export markets. Indonesia currently subsidizes biodiesel production at around 0.166 € per liter and will raise them to 0.201-0.241 € per liter in 2012 [17]. In addition, Indonesia has a differentiated export tax for crude palm oil to palm oil derived methyl-ester (PME). The price difference is estimated at 90-100 € per tonne of PME as compared to crude palm oil. While palm oil is not primarily traded for biodiesel production (see Section 6), the differentiated tax system promotes its local conversion into biodiesel whereas otherwise this process step would be made in European conversion plants. The same is true for tax differentiations in Argentina regarding soybean oil.

Technically, Indonesian biodiesel export volumes are restricted to secure local market supply. Due to the limited domestic market absorption – only 35% of the potential market volume (566 ktonnes) was actually consumed (196 ktonnes) in 2010 – exports have been temporarily permitted [17]. As a result, 80% of Indonesia's production was exported in 2010; primarily to the Netherlands, Italy, and Spain.

5. Global biodiesel net trade

Based on aforementioned market activities, the major biodiesel trade flows and volumes of the past years are depicted in schematic form (see following figures). Global net biodiesel trade data is taken from Lamers et al. [1] and extended to 2010 (see Table 6). It follows the assumptions that Brazil remains a closed market (due to the location of its plants and relatively high production prices in comparison to other exporters e.g. Argentina), exports from Argentina, Indonesia, and Malaysia are exclusively destined for EU and US consumption. In addition, Argentina, Indonesia, and Malaysia derive all exports through domestic production. US biodiesel imports are assumed to be re-exported to the EU – in particular until 2009. EU is regarded to be the key target destination for global biodiesel trade. EU exports are only accounted until 2007. To avoid potential double-counting (i.e. re-imports via the US), they are excluded in the following years.

Table 6. Total net biodiesel trade 2000-2010 [ktonnes].[6]
Source: [1]

	2000-2005	2006	2007	2008	2009	2010
AR, MY, ID exports	0	73	444	1,151	1,567	1,757
US net exports (US produced)	0	0	439	1,207	628	319
EU imports excl. US, AR, MY, ID	0	0	0	0	0	172
EU exports until 2006	0	0	0	0	0	0
Total world biodiesel trade	**0**	**73**	**882**	**2,358**	**2,195**	**2,249**
Share in global production	0%	1%	10%	18%	14%	14%

[6] Assumptions: Brazil remains a closed market. Exports from Argentina, Malaysia, and Indonesia are exclusively dedicated to markets in the EU and the US. Apart from the B99 effect in 2007-2009, none of the countries re-export biodiesel, but rather derive all exports through domestic production. For 2007-2009, all US imports are assumed to be re-exported to the EU.

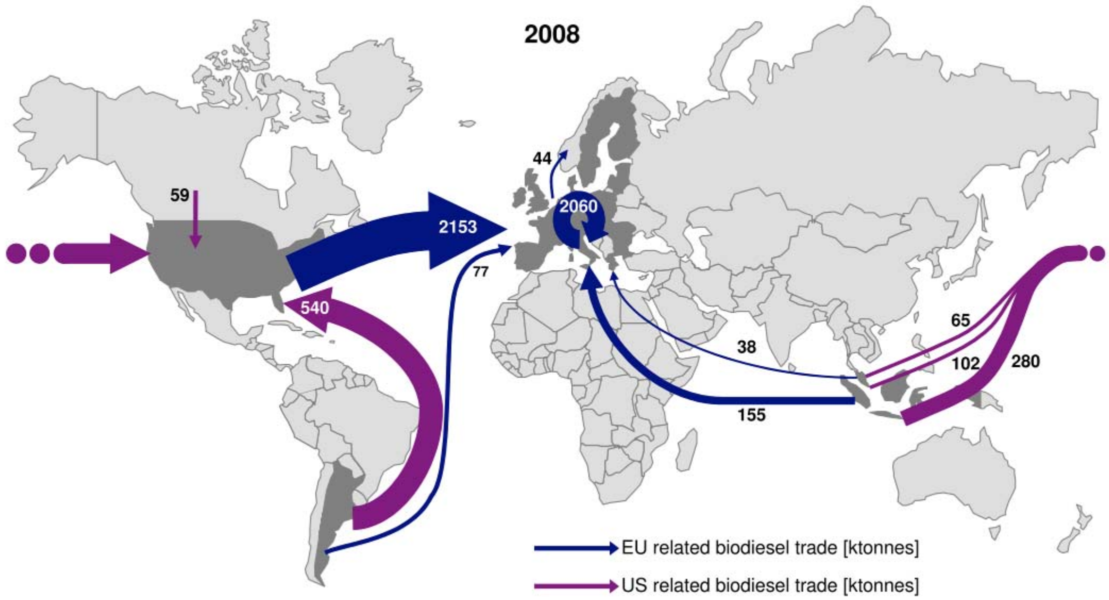

Figure 4. Global biodiesel trade streams in 2008 [ktonnes].
Source: [1]

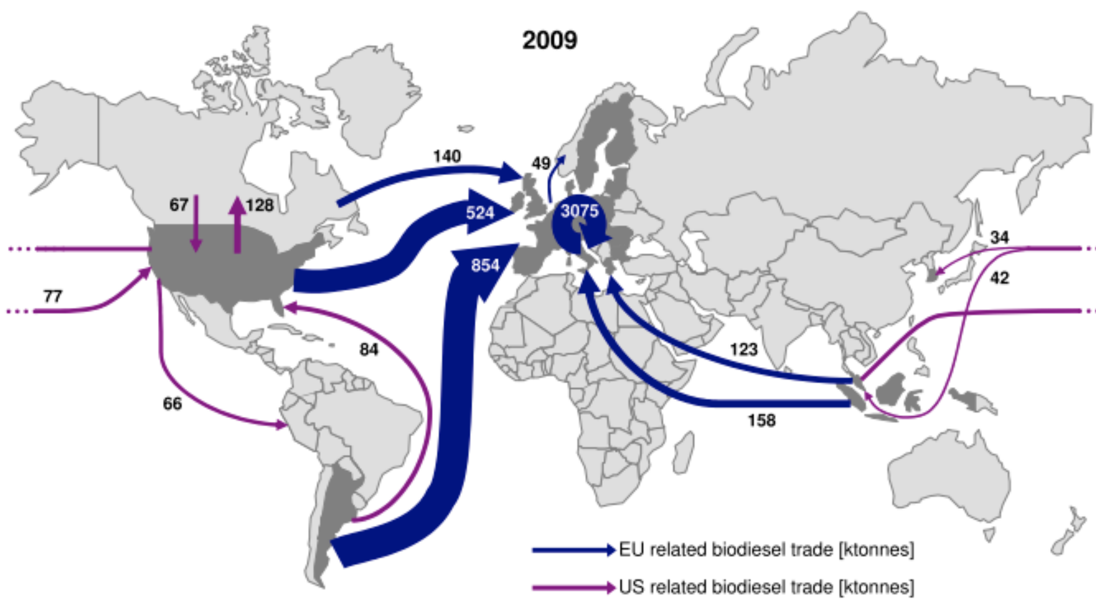

Figure 5. Global biodiesel trade streams in 2009 [ktonnes].
Source: [1]

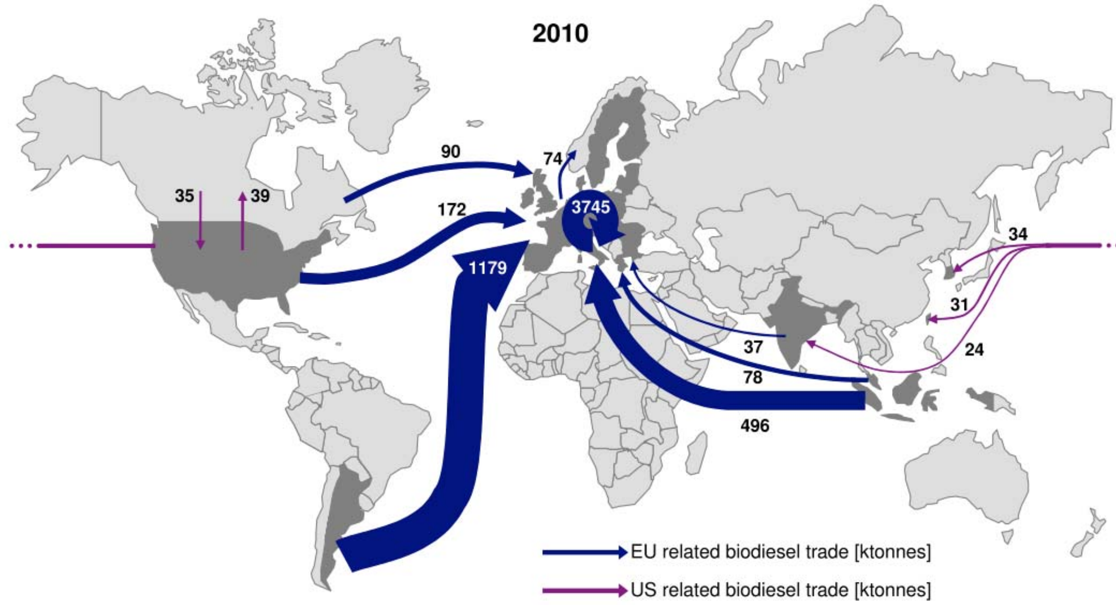

Figure 6. Global biodiesel trade streams in 2010 [ktonnes].

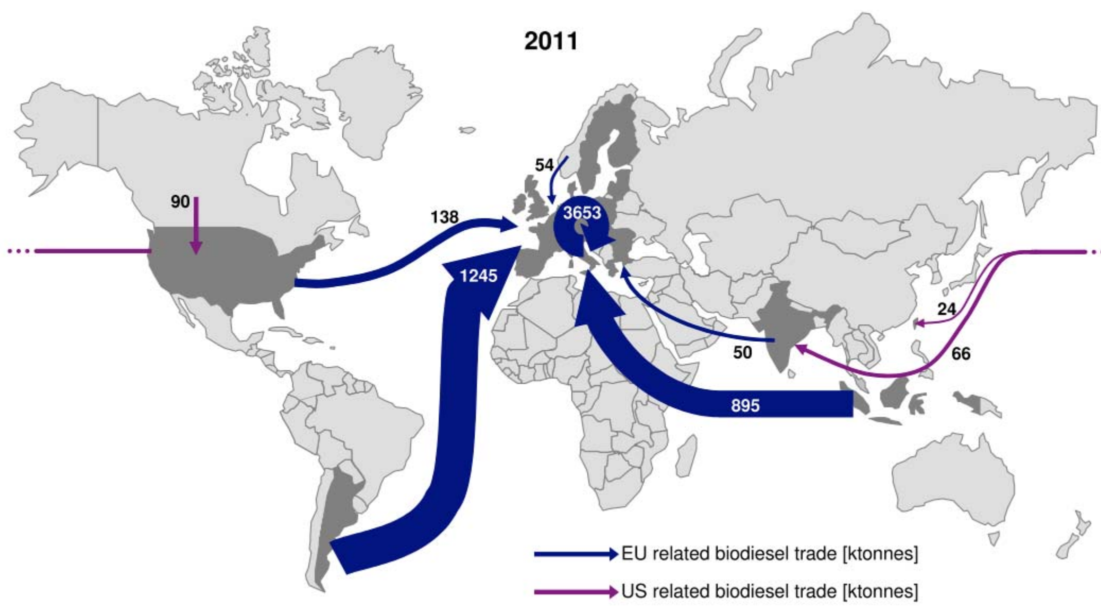

Figure 7. Global biodiesel trade streams in 2011 [ktonnes].

6. Vegetable oil trade related to biodiesel[7]

International production and consumption of vegetable oils increased constantly over the past ten years; net trade in vegetable oils alone (excluding oil grains other than soybeans) doubled (see Figure 8) [1]. Due to its comparatively low international market price, palm oil has grown fastest and now amounts to the largest trade volumes [40]. Soybean oil trade is the second largest when including the oil fraction in soybean trade (20%). Taking this into account, two thirds of global soybean oil trade has been in the form of soybeans. The underlying reason is primarily that countries with limited opportunity to expand oilseed production have increased in oilseed crushing capacity [41]; and soybean meal, a high quality protein, is a valued fodder in livestock production. Brazil, Argentina, and the US are key producers for soybeans and soybean oil and have shipped mainly to China, India, and Europe. Palm oil, 90% of which originated in Indonesia and Malaysia, has been primarily exported to China, India, Pakistan, the EU, and the Middle East [1]. Sunflower and rapeseed oil trade in comparison make up relatively small volumes. Rapeseed/canola oil trade is dominated by Canadian exports to the US, the EU and China [1]. In recent years, most EU imports in rapeseed and rapeseed oil came from the Ukraine [1, 28].

[7] Rosillo-Calle et al. [33] presented a detailed analysis of global vegetable oil markets in regards to biodiesel.

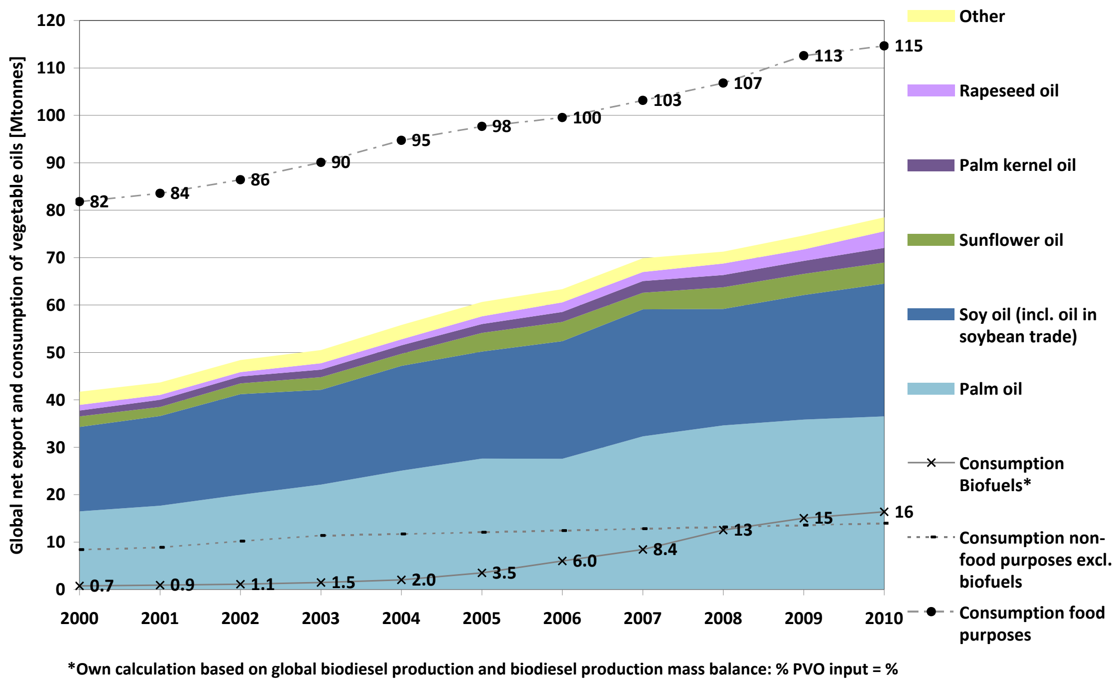

Figure 8. World net vegetable oil export and consumption [Mtonnes].
Source: [1, 42]

As Figure 8 illustrates, vegetable oil consumption by biofuels saw the largest relative increase. The strongest total increase though was linked to food and non-food consumption other than biofuels. Biofuel feedstocks depend on the geographic region. Biodiesel in the US, Argentina, and Brazil, is almost exclusively SME, whereas Indonesian and Malaysian biodiesel is almost purely PME. In the EU it is traditionally rapeseed oil methyl-ester (RME). As previously mentioned, the introduction of biofuel mandates and the price competitiveness of soy and palm oil[8] in comparison to rapeseed oil lead to an increase in their relative share in EU biodiesel production. Technical limitations though – as laid down in the EU biodiesel standard EN 14214 – cap the possible fraction of soy and palm oil biodiesel; particularly in the northern, relatively colder EU MS.[9] Despite its small share in global vegetable oil trade, rapeseed oil is very relevant in the EU context. This is illustrated in Figure 9 which differentiates between international EU imports and intra-EU trade in vegetable oil.

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[8] Palm oil enters the EU duty free.

[9] See http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/klima/Test_Biodiesel_11_-_Europa.pdf [November 3rd, 2011] for a biodiesel feedstock review in 2011.

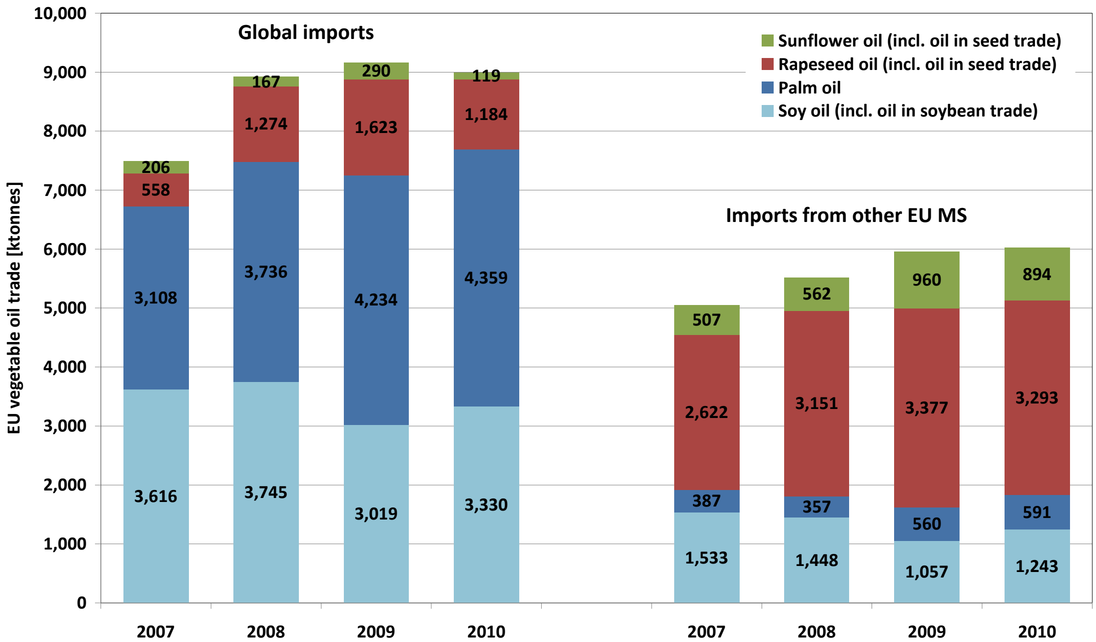

Figure 9. Imports of vegetable oil into the EU of global and other EU MS origin 2007-2010 [ktonnes].
Source: [1, 28]

7. Conclusions and Outlook

International biodiesel markets have grown tremendously over the past decade. To a large extent, the current industry has been interwoven into an already existing global vegetable oil and oilseed market (with similar players). While practically no biodiesel was traded 10 years ago, international volumes have reached 2.25 Mtonnes in 2010. Today's market, though volatile and policy dependent, has become much more transparent in comparison to its early stages. The EU has clearly been and will most likely remain the key production and consumption region for biodiesel until 2020. Many countries though have followed suit and implemented national blending targets for biodiesel, thus stimulating domestic production and consumption. Partly, such production has been targeted for export to the EU. These trade streams are likely to grow in the future. Economic margins under existing EU policy schemes (predominantly blending mandates) will remain low and comparative cost advantages will have to be used. This will cause a growth in production capacity in strategic locations offering diverse and cheap(er) feedstock and other input factors (including labor). A full utilization of existing EU conversion capacity is therefore unrealistic. Potential future investments in infrastructure and technical equipment in Eastern Europe (i.e. EU MS as well as their bordering states) could help increase the supply of cost competitive EU biodiesel feedstock.

8. Abbreviations

B99	Biodiesel blend with fossil diesel at a 99% biodiesel content ratio
EBB	European Biodiesel Board
EU	European Union
FAME	Fatty-acid methyl-ester
IPCC	Intergovernmental Panel on Climate Change
ktonnes	kilotonnes (1000 metric tonnes)
MS	Member State of the European Union
Mtonnes	Megatonnes (1000000 metric tonnes)
PME	Palm oil methyl-ester
RME	Rapeseed oil methyl-ester
SME	Soy oil methyl-ester
SRREN	Special Report on Renewable Energy
UFOP	Union zur Förderung von Oel- und Proteinpflanzen
UK	United Kingdom
USDA	United States Department of Agriculture

9. References

[1] Lamers P, Hamelinck C, Junginger M, Faaij A. International bioenergy trade – a review of past developments in the liquid biofuels market. Renewable and Sustainable Energy Reviews. 2011;15:2655-2676.

[2] Edenhofer O, R. Pichs-Madruga, Sokona Y, Seyboth K, Matschoss P, Kadner S, et al. IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation Cambridge University Press, Cambridge, UK and New York, USA; 2011.

[3] REN21. Renewables - Global Status Report - various issues. Paris, France: Renewable Policy Network for the 21st Century; 2011.

[4] EIA. Monthly Energy Review. Washington DC, USA: US Energy Information Administration (EIA); 2011.

[5] IEA. Medium-term oil market report. Paris, France: International Energy Agency; 2006.

[6] USDA. A USDA regional roadmap to meeting the biofuels goals of the Renewable Fuels Standard by 2022. Washington DC, USA: US Department of Agriculture; 2010.

[7] AREC. Personal Communication - Carlos St James. Argentinean Renewable Energy Chamber; 2010.

[8] ANP. Produção de Biodiesel - Metros Cúbicos. Sao Paulo, Brazil: Agência Nacional do Petróleo, Gás Natural e Biocombustíveis; 2011.

[9] USDA. Brazil - Biofuels Annual. Sao Paulo, Brazil: US Department of Agriculture, Foreign Agricultural Service; 2009.

[10] EBB. Statistics. Brussels, Belgium: European Biodiesel Board; 2011.

[11] USDA. EU27 - Biofuels Annual. The Hague, Netherlands: US Department of Agriculture, Foreign Agricultural Service; 2010.

[12] Eurostat. Data Explorer - nrg_1073a. Brussels, Belgium: Eurostat; 2010.

[13] FO.Licht. Vol. 8 (16). World Ethanol & Biofuels Report. Kent, UK & Ratzeburg, Germany: Informa UK Ltd.; 2010.

[14] USDA. Argentina - Biofuels Annual. Buenos Aires, Argentina: US Department of Agriculture, Foreign Agricultural Service; 2011.

[15] USDA. Malaysia - Biofuels Annual. Kuala Lumpur, Malaysia: US Department of Agriculture, Foreign Agricultural Service; 2011.

[16] Dillon HS, Laan T, Dillon HS. Government support for ethanol and biodiesel in Indonesia. Geneva, Switzerland: Global Subsidies Initiative of the International Institute for Sustainable Development; 2008.

[17] USDA. Indonesia - Biofuels Annual. Jakarta, Indonesia: US Department of Agriculture, Foreign Agricultural Service; 2011.

[18] FO.Licht. World Ethanol & Biofuels Report. Kent, UK & Ratzeburg, Germany: Informa UK Ltd.; 2009.

[19] LMC. Global production of biodiesel by continent. Oxford, UK: LMC International; 2009.

[20] EBB. An economic and security of supply analysis of the widening EU diesel deficit. Brussels, Belgium: European Biodiesel Board; 2008.

[21] Wiesenthal T, Leduc G, Christidis P, Schade B, Pelkmans L, Govaerts L, et al. Biofuel support policies in Europe: Lessons learnt for the long way ahead. Renewable and Sustainable Energy Reviews. 2009;13:789-800.

[22] Mitchell C, J. Sawin, G. R. Pokharel, D. Kammen, Z. Wang, S. Fifita, et al. Policy, Financing and Implementation. In: Edenhofer O, Pichs-Madruga R, Sokona Y, Seyboth K, Matschoss P, Kadner S, et al., editors. IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Cambridge, UK and New York, USA: Cambridge University Press; 2011.

[23] UFOP. Biodiesel 2009/2010. Berlin, Germany: Union zur Förderung von Oel- und Proteinpflanzen; 2010.

[24] UFOP. Biodiesel 2010/2011. Berlin, Germany: Union zur Förderung von Oel- und Proteinpflanzen; 2011.

[25] USDA. EU27 - Biofuels Annual. The Hague, Netherlands: US Department of Agriculture, Foreign Agricultural Service; 2009.

[26] EC. Regulation (EC) No 194/2009 of 11 March 2009 imposing a provisional countervailing duty on imports of biodiesel originating in the United States of America. Brussels: European Commission; 2009.

[27] Eurobserver. Biofuels Barometer - various issues. Observ'er, IJS, ECN, Eclarean, EC BREC; 2011.

[28] Eurostat. Data Explorer - EU27 Trade Since 1995 By CN8. Brussels, Belgium: Eurostat; 2011.

[29] USDA. Global Agricultural Trade System (GATS). Washington DC, USA: US Department of Agriculture, Foreign Agricultural Service; 2011.

[30] EC. TARIC Database. Brussels: European Commission; 2011.

[31] Eurostat. Personal Communication - Evangelos Pongas. 2010.

[32] USITC. Harmonized Tariff Schedule (HTS). Washington DC, USA: United States International Trade Commission; 2011.

[33] EC. Regulation (EC) No 598/2009 of 7 July 2009 imposing a definitive countervailing duty and collecting definitively the provisional duty imposed on imports of biodiesel originating in the United States of America. Brussels: European Commission; 2009.

[34] EC. Regulation (EC) No 599/2009 of 7 July 2009 imposing a definitive anti-dumping duty and collecting definitively the provisional duty imposed on imports of biodiesel originating in the United States of America. Brussels: European Commission; 2009.

[35] EBB. European Commission initiates probe into US biodiesel circumvention. Brussels, Belgium: European Biodiesel Board; 2010.

[36] Lamers P, McCormick K, Hilbert J. The emerging liquid biofuel market in Argentina: Implications for domestic demand and international trade. Energy Policy. 2008;36:1479-1490.

[37] MPOB. Monthly export volume and value of biodiesel: 2006 & 2007. Kuala Lumpur, Malaysia: Malaysian Palm Oil Board; 2007.

[38] MPOB. A summary of the performance of the Malaysian palm oil industry - 2008. Kuala Lumpur, Malaysia: Malaysian Palm Oil Board; 2008.

[39] MPOB. Overview of the Malaysian palm oil industry 2009. Kuala Lumpur, Malaysia: Malaysian Palm Oil Board; 2009.

[40] Hamelinck C, Koper M, Koop K, Alberici S. Implications for Ireland of international bioenergy trade. Utrecht, the Netherlands: Ecofys; 2010.

[41] USDA. Agricultural projections to 2017. Washington DC, USA: US Department of Agriculture, Interagency Agricultural Projections Committee; 2008.

[42] USDA. Production, Supply, and Distribution (PSD) Online. Washington DC, USA: US Department of Agriculture, Foreign Agricultural Service; 2010.

UNION ZUR FÖRDERUNG
VON OEL- UND PROTEINPFLANZEN E. V.
Claire-Waldoff-Straße 7 • 10117 Berlin
info@ufop.de • www.ufop.de