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RESEARCHREPORT

The EU Biofuel Policy and Palm Oil: Cutting subsidies or cutting rainforest?

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September 2013

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Table of Contents

Acknowledgements.....	1
Rationale and Objective of the Study	2
Data and Method	4
Growth of Palm Oil Consumption in the EU.....	6
Current and Prospective Use of Palm Oil in the EU Energy Sector.....	10
Lessons Learned for the EU Biofuel Policy	13
References.....	14
Annex I. Summary of the Quantitative Analysis	17

List of Figures

Figure 1: EU-27 Import of Palm Oil (Million Metric Tonnes): Estimates from different sources.....	4
Figure 2: Palm Oil Use in the EU-27 by Sector in 2006-2012, Thousand Metric Tonnes.....	6
Figure 3: Total Domestic Disappearance of Palm Oil in Major European Markets in 2006-2012, Thousand Metric Tonnes.....	7
Figure 4: Current Prices Of Selected Vegetable Oils 1980-2013, Us\$ Per Metric Tonne.....	9
Figure 5: Use Of Vegetable Oils and Animal Fats as Biodiesel Feedstock In EU-27 in 2006-2012, Thousand Metric Tonnes.....	11
Figure 6: Use of Vegetable Oils for Electricity And Heat Generation In EU-27 in 2006-2012, Thousand Metric Tonnes.....	11
Figure A1: Key Drivers of Palm Oil Use in the EU.....	17

List of Tables

Table 1: End uses of Palm Oil in the EU-27 in 2006-2012, Thousand Metric Tonnes.....	8
Table 2: EU-27 Current and Prospective Production and Import of Biodiesel, and use of Palm Oil in Biodiesel Production.....	12
Table A1: Variables and their Abbreviations.....	18



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Rationale and Objective of the Study

On September 11, 2013 the European Parliament will vote in plenary on legislation revisiting the EU support to biofuels. This vote will finalize the official reaction of EU policy-makers to the proposal made by the European Commission in October 2012 to reduce the contribution of food-based biofuels towards the EU target of renewable energy in transport by 2020 to 5 per cent from the current 10 per cent target (*Proposal for a directive, 2012*).¹

The national policies of the EU member states directed to reaching the target have included various measures of government support for biofuels, such as exemption of biofuels from excise and pollution taxes on motor fuels as well as consumption (fuel-blending) mandates (Gerasimchuk, Bridle, Beaton, & Charles, 2012). Mandates act in the same way as other subsidy forms, driving up market clearing prices and setting the demand floor, thereby improving the competitiveness of otherwise unviable biofuel producers (Koplow, 2009). Using the price-gap approach, the International Energy Agency estimated the value of biofuel subsidies in the EU in 2011 at €8.4 billion (US\$11 billion), with the bulk of these subsidies going to biodiesel (International Energy Agency [IEA], 2012). Using the bottom-up inventory method, the International Institute for Sustainable Development (IISD) estimates the value of the government support to biofuels in the EU in the same year within the range of €5,5 billion to €6,9 billion (IISD-GSI, 2013).²

The EU and many other countries introduced biofuel subsidies to facilitate the transition from fossil fuels to more sustainable fuels in transport, reduce greenhouse gas emissions, and support jobs in the agricultural sector. However, EU biofuel policies have been a costly way of meeting these objectives (Gerasimchuk, Bridle, Beaton, & Charles, 2012), and their implementation has led to unintended adverse effects. These include the impacts of the stimulated demand for biofuels on the level and volatility of agricultural commodity prices (FAO, IFAD, IMF, OECD, UNCTAD, WFP, World Bank, et al., 2011), carbon dioxide emissions derived from indirect land-use change (ILUC) caused by expansion of demand for biofuel feedstocks (Laborde, 2011), and potential infringements on land rights outside the EU (so-called “land grabbing”) (Kelly, 2012). However, there remain some information gaps and blind spots that impede informed decision making on EU biofuel policies, particularly with respect to consistent actual data on trade in and consumption of various biofuel feedstocks in Europe.

One of these blind spots has been the impact of the EU biofuel policies on palm oil consumption patterns. Palm oil can be commonly used as feedstock for biodiesel along with rapeseed oil and soybean oil, as discussed later in this report.³ However, there are many concerns about the sustainability of expanding palm oil production in Indonesia, Malaysia and other tropical countries (Text Box 1).

On the one hand, the European biodiesel industry has argued that the use of palm oil⁴ in the EU is small compared to food uses (European Biodiesel Board, 2008). On the other, if the EU biofuel policies contribute to increased production of unsustainable palm oil (either directly or indirectly) the policy-makers and the broader public should be aware of this fact. Hence, this study was designed to explore the following two hypotheses:

¹ On June 20, 2013 the Industry, Research and Energy (ITRE) Committee voted to move the cap to 6.5 per cent. On July 2013 11, the Environment (ENVI) Committee voted in favor of the 5.5 per cent cap (Keating, 2013). The plenary vote on September 11 will be the decisive one, to be followed by the consideration of the legislative initiative by the European Council.

² For more on IISD-GSI's extensive work on biofuel subsidies, both in the EU and globally, please consult <http://www.iisd.org/gsi/biofuel-subsidies>.

³ There are two main types of biofuels used in road transport: ethanol, based on sugar and starch feedstocks (corn, sugar cane, sugar beet, wheat and others) and biodiesel, based on vegetable oils or animal fats.

⁴ Hereinafter, unless stated otherwise, “palm oil” stands for crude palm oil.



- *“The more biodiesel is produced in the EU countries (excluding biodiesel from waste/used oil & fats), the more palm oil is consumed in the EU biodiesel sector.”*
- *“The bigger the use of all vegetable oils for both biodiesel production and energy & heat generation in the EU, the more palm oil is used for both biodiesel and energy & heat generation in the EU.”*

TEXT BOX 1. PALM OIL EXPANSION

The most suitable areas for oil palm cultivation are around ten degrees off the equator, in tropical countries (Dutch Product Board for Margarine, Fats and Oils [MVO], 2010). The global production of palm oil is estimated at 56.2 million tonnes in 2013 (53.7 million tonnes in 2012), with 85 per cent coming from two countries: Indonesia (29 million tonnes) and Malaysia (19 million tonnes) (Mielke, 2013a). Until now, the global production of palm oil has more than doubled every 10 years, and by 2020 it is expected to grow to 78 million tonnes, i.e., by 40 per cent from the current level (Mielke, 2013a).

To date (and to a great extent), such rapid growth in palm oil production can be explained by an expansion of the plantation area (May-Tobin, et al., 2012) that is associated with a number of sustainability concerns. They include:

- Direct land-use change and deforestation. To a significant extent, palm oil production has been increasing at the expense of the global carbon stocks, such as tropical forests and peatland (Wicke, Sikkema, Dornburg, & Faaij, 2011; Page, Morrison, Malins, Hooijer, Rieley, & Jauhainen, 2011). For instance, in Kalimantan (Indonesia), from 1990 to 2010, 90 per cent of lands converted to oil palm were forested (47 per cent intact, 22 per cent logged, 21 per cent agroforests) (Carlson, Curran, Asner, McDonald Pittman, Trigg, & Adeney, 2013). If rainforest is cleared (or peatlands are drained) to convert the land for oil palm plantations, the carbon is released into the atmosphere, contributing to global climate change. The loss of tropical forests also results in loss of biodiversity, endangering some of the world's iconic species such as orangutans (Verchot, et al., 2010).
- Indirect land use change (ILUC) and deforestation. Even if biodiesel companies procure palm oil certified as “sustainable,” they may be diverting it from other uses where it will be replaced by unsustainable palm oil. Demand for palm oil from established certified plantations is simply leading to expansion of other palm oil plantations onto forested land. Alternatively, a palm oil company may plant oil palm on agricultural land that was used to grow other crops, but since the demand for these original crops remains, they may be planted on new land formerly under forest. The latter ILUC observation is also an argument that applies to all vegetable oils, including rapeseed oil, used as feedstock for biodiesel production in the EU (Laborde, 2011; Malins, 2013).
- Infringement of land rights and labour standards. There have been a number of reports of situations where palm oil industrial development has involved infringement of the land rights of smallholders, indigenous people (Farmer groups want fair probe on land grabbing, 2012), instigation of community conflicts and violation of labour standards (Skinner, 2013).

The EU has attempted to address these concerns by applying sustainability criteria to palm oil imported into the EU for use in biofuels. However, there have been many compliance concerns regarding the existing palm oil sustainability schemes such as those of the Roundtable for Sustainable Palm Oil (RSPO) or the Indonesian Palm Oil Council (GAKPI) (May-Tobin, et al., 2012).



Data and Method

There are significant discrepancies among different data sources on vegetable oils. The principle data sources of interest for this report are the European Commission and Eurostat, Food and Agriculture Organisation (FAO) and FAOSTAT, U.S. Department of Agriculture (USDA), Federation of the European Vegetable Oil and Proteinmeal Industry (FEDIOL), and Oil World.

The differences in estimates are most significant when it comes to trade flows. For the EU-27 import of palm oil,⁵ for instance, FAOSTAT estimates tend to be the highest, whereas FEDIOL estimates tend to be the lowest. At the time of publication of this report, estimates of palm oil import to EU-27 in 2012 have been available neither from FAOSTAT nor from FEDIOL. Meanwhile, the European Commission and USDA both reported the volume of the EU-27 import of palm oil in the 2012/13 marketing year at 5.6 million tonnes (European Commission, 2013) (US Department of Agriculture, 2013). Further, Oil World, a private forecasting service for oilseeds, oils and meals,⁶ estimated the EU-27 import of palm oil in 2012 at 6.3 million tonnes.

These discrepancies may be explained by different approaches to accounting for third-party trade in vegetable oils (re-export and re-import) as well as inconsistencies in application of the Harmonised Trade Schedule codes, and differences in methodology (bottom-up reporting from industry versus customs statistics). Discrepancies among different sources of data are also illustrated in Figure 1.

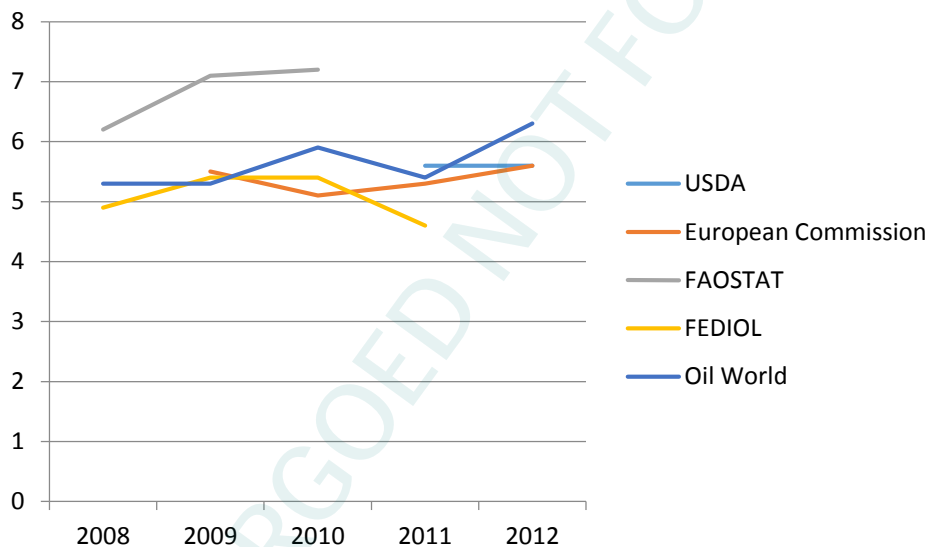


FIGURE 1: EU-27 IMPORT OF PALM OIL (MILLION METRIC TONNES): ESTIMATES FROM DIFFERENT SOURCES

Source: IISD-GSI compilation of data points from European Commission, 2013; FEDIOL, 2012; FAOSTAT, n.d.; Oil World, 2013; U.S. Department of Agriculture, 2013.

⁵ Hereinafter, in the report “palm oil” means crude palm oil, excluding palm kernel oil.

⁶ <http://www.oilworld.de>



Among all these data sources, Oil World (also known as ISTA Mielke) is the only one that provides a breakdown of the principal end uses of vegetable oils in the EU-27 as a whole, and its 16 major member countries. The 16 countries accounted for over 90 per cent of total vegetable oil consumption in the EU in 2012 (Oil World, 2013). Due to these higher-resolution data, and well as the availability of estimates for the latest calendar year, Oil World data are widely used by the industry, e.g., the Malaysian Palm Oil Council (Malaysian Palm Oil Council, 2013), FEDIOL (FEDIOL, 2013), and the Dutch Product Board for Margarine, Fats and Oils (MVO, 2010).

This research paper, therefore, draws primarily on the Oil World dataset underlying its Oil World Annual 2013 report. Hereinafter, if not stated otherwise, the data used in the report are the Oil World data. For quantitative analysis, a simple regression method has been used, as explained in Annex I.

However, given the aforementioned discrepancies with other, less-detailed sources of data, and the fact that some of the factors determining palm oil consumption in the EU have been more difficult to quantify, the study combines quantitative and qualitative methods. The discussion below is underpinned by a wider desk review of literature to determine the trends in palm oil consumption in EU-27. Further, the draft of this paper has been peer reviewed by a number of vegetable oil market experts, whose names and roles have been listed in the acknowledgements section of the paper.



Growth of Palm Oil Consumption in the EU

The EU-27 is one of the key consumers of palm oil globally; its share of global palm oil consumption has remained relatively stable over the last 20 years, ranging from 12 to 15 per cent (FAOSTAT, n.d.; Oil World, 2013). The other key consumers are India (around 15 per cent of global consumption in 2010–2013), China (around 14 per cent), Indonesia (12–15 per cent), and Malaysia (around 11 per cent) (MVO, 2010; Oil World, 2013; Embassy of the Republic of Indonesia, Brussels, 2012).

Over 2006–2012, the EU-27 countries increased their total use of palm oil by 40 per cent, from 4.5 to 6.4 million tonnes, in line with the global expansion of palm oil production and consumption (Figure 2). In 2012, about 1.9 million tonnes were used for biodiesel production⁷ and 0.6 million tonnes for electricity and heat generation. The bulk, 3.9 million tonnes, was used by the non-energy sector, which is represented mainly by food production, but also by the personal care (cosmetics, detergents) and oleo-chemical (paints, lubricants) industries.

On the EU-27 scale, the biofuels industry has increased its use of palm oil by 365 per cent over 2006–2012, which can be linked primarily to the growth in biodiesel production stimulated by government policies during the same period. The increase in palm oil consumption in the biofuels sector has amounted to 1.6 million tonnes, or 80 per cent of the total increase in palm oil consumption in Europe (1.9 million tonnes) over 2006–2012. 10 per cent of this increase was accounted for by the growing palm oil consumption in the electricity and heat generation sector, and another 10 per cent by growing consumption in other sectors, mainly food processing. This dramatic rise in the EU biofuel sector’s palm oil consumption is evident not only in the Oil World data set, but also in other sources of data such as the USDA (U.S. Department of Agriculture, 2012)

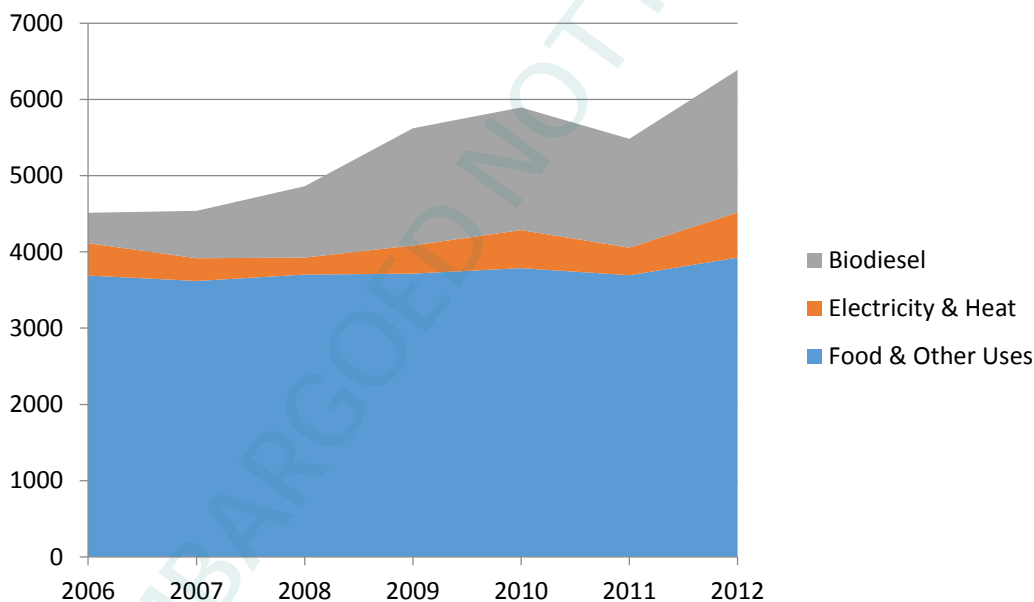


FIGURE 2: PALM OIL USE IN THE EU-27 BY SECTOR IN 2006–2012, THOUSAND METRIC TONNES

Source: IISD-GSI analysis of Oil World data.

⁷ 1.9 million tonnes is the amount of palm oil processed into biodiesel in the EU-27. In addition to this, Europe also imports palm oil-based biodiesel. In particular, the Indonesian Palm Oil Association (GAPKI) reports that in 2012 its members “delivered around 1.4 million tonnes of biodiesel last year, with the sizeable amount of it going to the EU” (Yulisman, 2013).



Europe's largest importer and processor of palm oil is the Netherlands (Text Box 2). Domestic disappearance⁸ of palm oil in this country doubled since 2006 to 1.3 million tonnes in 2012. The Netherlands is followed by Italy and Germany, each of which used slightly less than 1 million tonnes in 2012. In these three countries (as well as in Spain), palm oil consumption has significantly increased, not only in the energy sector, but also in the food and other uses sector. France has also increased its palm oil consumption in both sectors, but at a more moderate pace (from 0.3 to 0.4 million tonnes).

On the other hand, the U.K., another large market, has substantially reduced palm oil use in both biofuel and non-energy sector by about one third. The other EU country that has considerably reduced its overall palm oil consumption is Sweden. Further country-specific details are presented in Figure 3 and Table 1.

TEXT BOX 2. PALM OIL USE IN THE NETHERLANDS

The Netherlands plays a leading role in the European palm oil market on account of the port of Rotterdam. About 80 per cent of the EU's imports of edible oils, fats and oleo chemicals enter through the port. Palm oil products, with a share of 60 per cent, are by far the most important category (MVO, 2010). In recent years, the port of Rotterdam has benefited from new investments into palm oil processing facilities by both Southeast Asian and European companies.

The Netherlands re-exports a large amount of the palm oil it imports and processes into products such as palm olein, palm stearin, hydrogenated or inter-esterified palm oil, or biodiesel. These products are sold mainly within the EU, in particular to Germany and Belgium (MVO, 2010; Malaysia External Trade Development Corporation, 2012).

In 2011 the Finland-based company Neste Oil opened a new biodiesel plant in Rotterdam, which explains the subsequent rise in palm oil use in the Netherlands. The plant has the capacity to process 0.8 million tonnes of vegetable oils per year, using hydrotreatment technology for feedstock with a higher melting temperature, such as palm oil (Lane, 2012). According to Oil World estimates, in 2012 the Neste Oil plant in Rotterdam consumed 0.4 million tons of palm oil (Oil World, 2013).

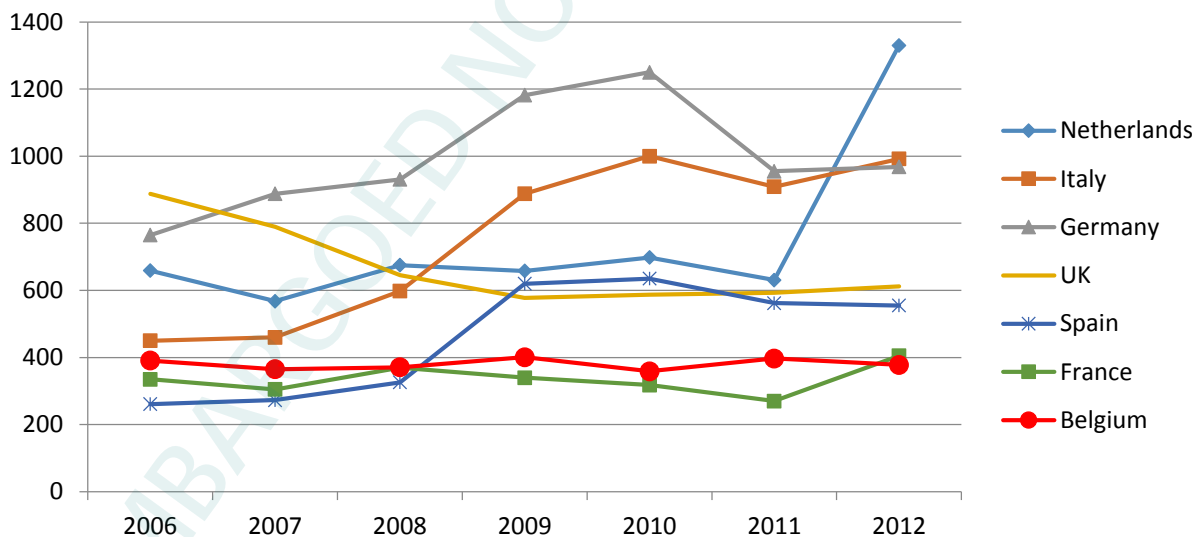


FIGURE 3: TOTAL DOMESTIC DISAPPEARANCE OF PALM OIL IN MAJOR EUROPEAN MARKETS IN 2006-2012, THOUSAND METRIC TONNES

Source: IISD-GSI analysis of Oil World data

⁸ The term "domestic disappearance" is largely synonymous with consumption, but also includes losses and waste.



TABLE 1: END USES OF PALM OIL IN THE EU-27 IN 2006-2012, THOUSAND METRIC TONNES

COUNTRY	BIODIESEL PRODUCTION			ELECTRICITY & HEAT GENERATION			OTHER USES: MAINLY FOOD, BUT ALSO PERSONAL CARE AND OLEO-CHEMICAL PRODUCTS			TOTAL		
	2006	2012	CHANGE	2006	2012	CHANGE	2006	2012	CHANGE	2006	2012	CHANGE
EU-27, including:	402	1869	+365%	420	590	+40%	3692	3925	+6%	4514	6384	+41%
Netherlands	5	480	+9500%	170	250	+47%	484	600	+24%	659	1330	+102%
Italy	60	220	+267%	n/a	190	n/a	390	582	+49%	450	992	+120%
Germany	100	300	+200%	250	150	-40%	415	518	+25%	765	968	+27%
U.K.	60	38	-37%	-	-	-	828	574	-31%	888	612	-31%
Spain	30	200	+567%	-	-	-	231	355	+54%	261	555	+113%
France	73	110	+51%	-	-	-	262	295	+13%	335	405	+21%
Belgium	3	40	+1233%	-	-	-	388	338	-13%	391	378	-3%
Finland	0	200	n/a	-	-	-	12	20	+66%	12	220	+1730%
Poland	-0	60	n/a	-	-	-	160	159	-1%	160	219	+37%
Denmark	10	9	-10%	-	-	-	132	127	-4%	142	136	-4%
Sweden	5	21	+320%	-	-	-	130	97	-25%	135	118	-13%
Portugal	20	50	+150%	-	-	-	26	26	0%	46	76	+65%
Czech Rep.	12	23	+92%	-	-	-	22	25	+14%	34	48	+41%
Austria	15	40	+166%	-	-	-	20	7	-65%	35	47	+34%
Hungary	4	18	+350%	-	-	-	12	3	-75%	16	21	+31%
Lithuania	5	5	0%	-	-	-	4	7	+75%	9	12	+33%

Source: IISD-GSI analysis of Oil World data.

Looking further into the details of palm oil use in Europe, it has been suggested that palm oil is Europe's "marginal vegetable oil," replacing other vegetable oils and fats once they become less readily available (Malins, 2013).

There are two interrelated reasons why palm oil can act as a "marginal" vegetable oil in Europe. First, palm oil is increasingly available on the world market due to increasing production area and the high yields of oil palm. According to the UN Food and Agriculture Organization, on average, land planted with palm oil produces 5 to 10 times more oil per hectare (including palm kernel oil) than any other vegetable crop: 3.41 metric tonnes per hectare for palm oil, compared with just 0.68 metric tonnes for rapeseed and 0.36 tonnes for soy (FAOSTAT). Further, compared to soybean or rapeseed oil, palm oil derives a much larger share of its value from the oil, as opposed to the oilmeal used as animal feed. Thus, when demand for fats and oils increases independently of additional demand for livestock, that imbalance will favour increased production of palm oil to address the shortfall (Martin, 2013).

Second, and as a result of its increasing production and availability, palm oil has been by far the cheapest vegetable oil on the world market. For instance, in July 2013 a tonne of palm oil was 27 per cent cheaper than a tonne of rapeseed or soybean oil (see Figure 4).

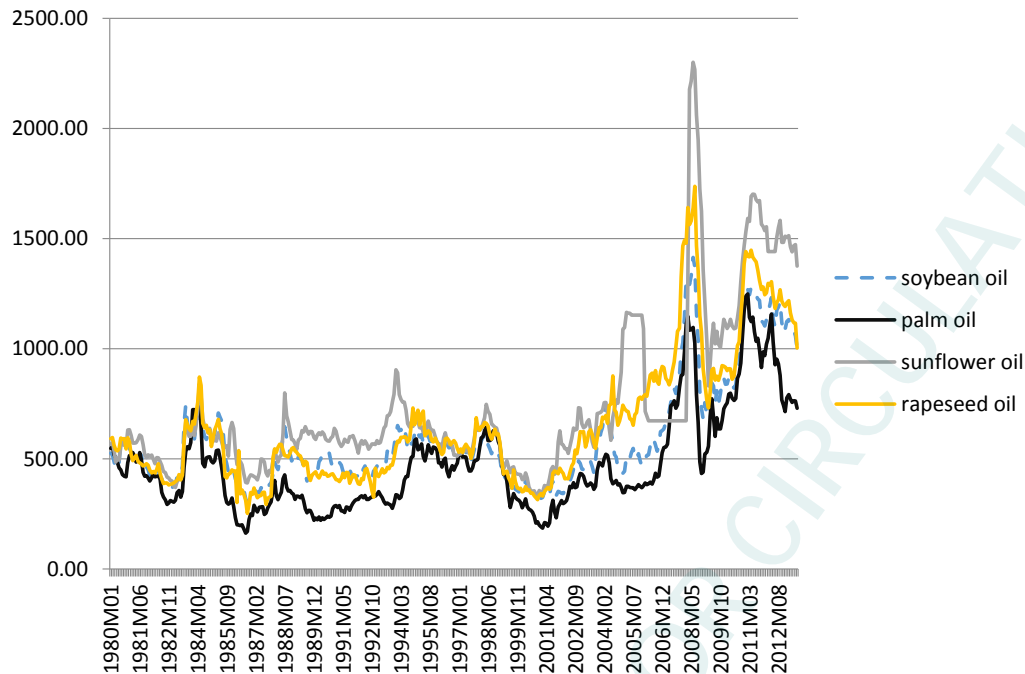


FIGURE 4: CURRENT PRICES OF SELECTED VEGETABLE OILS 1980-2013, US\$ PER METRIC TONNE

Source: Graphic representation of IMF primary monthly commodity price data (IMF, n.d.).

In Europe palm oil has in recent years partly filled the niche of North American soybean oil, as its export to Europe has dropped given both disruptions of supply by exporter countries such as Argentina (Mitra & Josling, 2009) and Europe's own GMO policies that restrict the food uses of this commodity in Europe (Hunt, 2012). Similarly, palm oil can substitute for other vegetable oils if their harvest has been low due to climatic conditions.



Current and Prospective Use of Palm Oil in the EU Energy Sector

The EU strategy of diversifying its energy mix through biofuels has been promoted with the objective of reducing greenhouse gas emissions, improving the energy security situation and supporting rural jobs by giving European farmers a stable source of income in the form of demand for biofuel feedstocks (Directive 2003/30/EC) (Directive 2009/28/EC). For biodiesel, the principal European-grown feedstock has been rapeseed oil. Nevertheless, it becomes increasingly difficult for European rapeseed oil to compete with imported palm oil for biodiesel uses given the low relative price of the latter.

Initially, EU-27 rapeseed production increased to meet the new demand from the biofuels industry, from 16 million tonnes in 2006 to 21.4 million tonnes at its maximum in 2009 (FEDIOL, 2012). However, since this increase (and despite the quickly increasing prices for rapeseed), European rapeseed production has remained stable and is forecast to remain at the same level—within the range of 19 to 21 million tonnes per year—in 2014–2015 (FEDIOL, 2012; European Commission, 2013). Further, to keep up with the demand for rapeseed oil from the biofuels industry, the EU increased its rapeseed import from 0.7 million tonnes in 2006 to 2.7 million tonnes in 2011 (FEDIOL, 2012).

Some industry experts have suggested that “there is not enough acreage in the EU to raise production sufficiently to satisfy requirements for oilseeds and products, grains and other agricultural commodities” (Mielke, 2013b). However, it has also been argued that “although it would be agronomically possible to grow all the feedstock needed to reach the policy goals domestically, the E[uropean] C[ommission] believes that 30 percent of the feedstock and biofuels will have to be imported to reduce price pressures on EU feedstock” (U.S. Department of Agriculture, 2012, p. 2).

Indeed, “agronomically” it could be suggested that Europe can further increase its rapeseed production to supply the biodiesel sector. According to Eurostat, rapeseed crop yields in recent years in the EU have largely varied, so there is room for productivity increases. However, these would require considerable investment, while Europe’s high cost of agricultural production is already noteworthy in comparison with low-cost agricultural commodities from developing countries.

Thus, the biodiesel sector has had to increasingly rely on palm oil as its feedstock. Over 2006–2012, the share of palm oil in the feedstock mix for biodiesel produced in Europe increased from 8 to 20 per cent (from 0.4 million tonnes to 1.9 million tonnes). The share of waste and used oils and fats also increased from 5 to 11 per cent. The share of rapeseed oil among biofuel feedstocks by weight grew in absolute volumes (from 3.3 million tonnes to 5.4 million tonnes), but dropped from 66 per cent of the mix in 2006 to 57 per cent in 2012.

Further, direct use of rapeseed oil as a motor fuel has also dropped. The share of rapeseed oil in vegetable oil use for electricity and heat generation has also decreased—in this sector, although it is present in only three of the EU countries (the Netherlands, Germany and Italy), palm oil has become the principle feedstock. Figures 5 and 6 present more details based on (Oil World, 2013).

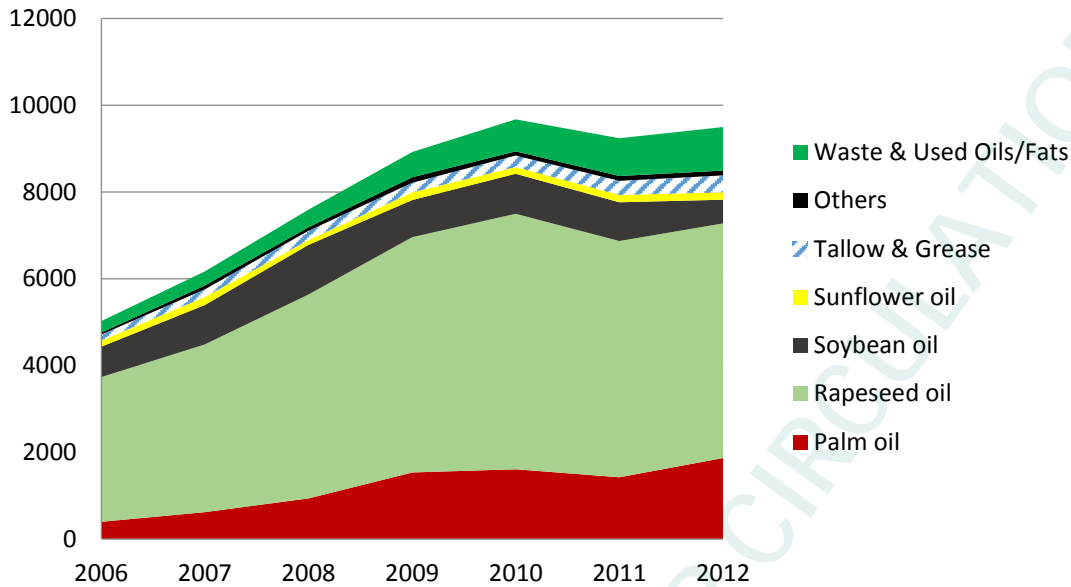


FIGURE 5: USE OF VEGETABLE OILS AND ANIMAL FATS AS BIODIESEL FEEDSTOCK IN EU-27 IN 2006–2012, THOUSAND METRIC TONNES

Source: IISD-GSI analysis of Oil World data.

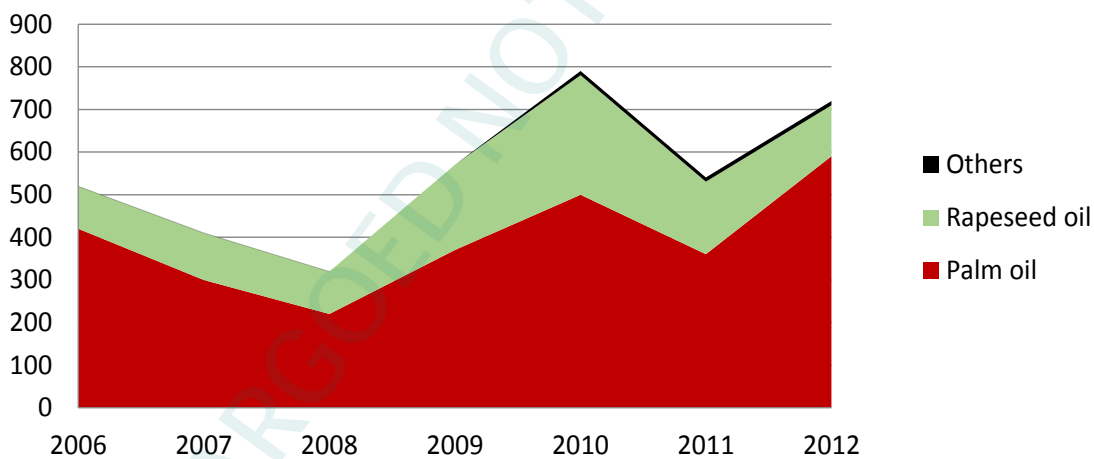


FIGURE 6: USE OF VEGETABLE OILS FOR ELECTRICITY AND HEAT GENERATION IN EU-27 IN 2006–2012, THOUSAND METRIC TONNES

Source: IISD-GSI analysis of Oil World data.

As discussed in the previous section, different EU countries have demonstrated different trends in palm oil consumption in the energy sector in 2006–2012. Therefore, to determine the overall pattern across the EU, the Oil World panel data have been analyzed using a simple regression analysis (see Annex I). According to this analysis, the data are consistent with a unit increase in biodiesel production corresponding to a 0.11 unit increase in palm



consumption in the EU biodiesel sector. **In other words, for every extra tonne of biodiesel produced in the EU in 2006–2012, there was an increase of 110 kilograms of palm oil consumed as biodiesel feedstock.** It has to be noted, however, that biodiesel production in the EU actually decreased in 2010, and, though it increased in 2011 and 2012, it still did not return to its 2009 historic maximum: palm oil consumption in the biofuel sector in Europe steadily increased over the observed period.

Moreover, the same competitiveness issues apply not only to feedstock production in the EU, but also to production of biodiesel itself. Sourcing the lowest-cost options, the EU-27 countries have increased imports of biodiesel from 60 thousand tonnes in 2006 to 2 million tonnes 2012 (U.S. Department of Agriculture, 2012), and the share of palm oil in biodiesel imported to certain EU countries can be significant. In particular, in Spain the share of biodiesel imported from Argentina and Indonesia was estimated as high as 89 per cent of domestic consumption in 2011, and all biodiesel imported from Indonesia was based on palm oil (APPA Biocarburantes, 2012, Yulisman, 2013).

TABLE 2: EU-27 CURRENT AND PROSPECTIVE PRODUCTION AND IMPORT OF BIODIESEL, AND USE OF PALM OIL IN BIODIESEL PRODUCTION

	2010	2015	2020
EU-27 production of biodiesel, thousand tonnes of oil equivalent (NREAPs)*	6,976	10,255	13,824
EU-27 production of biodiesel, thousand metric tonnes (NREAPs)*	8,112	11,924	16,077
EU-27 production of biodiesel, thousand metric tonnes **	9,642	-	-
EU-27 consumption of palm oil in biodiesel production, thousand metric tonnes	1,607**	2,100***	2,600 - 2,700***
EU-27 import of biodiesel, thousand tonnes of oil equivalent*; up to 30–50 per cent of these imports may use palm oil as a feedstock****	3,980	4,287	7,825

* According to the National Renewable Energy Action Plans as summarized in Beurskens, Hekkenberg, & Vethman, 2011. Converted using the Eurostat ratio: 1 tonne biodiesel = 0.86 toe.

** Oil World data.

*** IISD-GSI projections for the business-as-usual scenario based on the analysis of the Oil World panel data for the EU countries over 2006–2012.

**** According to D. Laborde (personal communication, August 21, 2013).

The National Renewable Energy Action Plans (NREAPs) of many EU countries also provide for significant volumes of biodiesel import, especially toward 2020 (see Table 2). Analysis of both the Oil World panel data and the National Renewable Energy Action Plans of the EU member states therefore suggests that **the business-as-usual scenario of the EU biofuel consumption will lead to increased consumption of palm oil in absolute volumes. The palm oil will be used in feedstock for both EU-processed and imported biodiesel.**

Under this scenario (a 0.11 unit increase in palm oil use for each extra unit of biodiesel produced in the EU, as in 2006–2012), **by 2020 the EU biodiesel sector will consume around 2.6 - 2.7 million tonnes of palm oil, or 40 per cent more than in 2012.** This forecast may be triangulated by the observation discussed in the previous section and Text Box 1: if the EU share of global palm oil consumption remains constant, as it has over the past 20 years (12–15 per cent), it will grow at the same pace as the global consumption and production of palm oil (i.e., 40 per cent from 2012–2013 according to the Oil World projections (Mielke, 2013a)).

The amount of palm oil as feedstock underlying biodiesel import to the EU is more difficult to quantify, but it is likely to be significant, on the order of **2.3–3.9 million tonnes** by 2020 (based on the 30–50 per cent share of palm oil biodiesel in EU biodiesel imports in 2012–2013 according to D. Laborde (personal communication, August 21, 2013).



Lessons Learned for the EU Biofuel Policy

The EU biofuels industry has increased its use of palm oil by 365 per cent over 2006–2012, from 0.4 to 1.9 million tonnes per year. The additional demand can be linked primarily to the growth in biodiesel production stimulated by government policies during the same period. The increase in palm oil consumption in the biofuels sector has amounted to 1.6 million tonnes, or 80 per cent of the total increase in palm oil consumption in Europe (1.9 million tonnes) over 2006–2012. At least 10 per cent of this increase was accounted for by increasing palm oil consumption in the electricity and heat generation sector, and another 10 per cent by growing consumption in other sectors, mainly food processing.

Every extra tonne of biodiesel produced in the EU in 2006–2012 was associated with an extra 110 kilograms of palm oil consumed as biodiesel feedstock. If no policy change occurs, and this trend persists, by 2020 the EU biodiesel sector will consume around 2.6 – 2.7 million tonnes of palm oil, or 40 per cent more than in 2012. Additionally, under the business-as-usual scenario, the EU will also increase imports of biodiesel, a significant share of which is based on palm oil.

The efforts that the EU has undertaken on different levels to switch to palm oil certified as “sustainable” address only concerns about direct land-use change. However, “sustainable” palm oil use also may have indirect land use change effects. That is, the EU’s increased use of certified palm oil may be diverting it from the uses where it will be replaced by unsustainable palm oil.

The only unequivocal way to cut this trend and prevent the further increase of palm oil consumption in the EU is to freeze its biodiesel production and consumption at current levels in accordance with the European Commission’s legislative proposal of October 17, 2012 that seeks to limit the contribution of food-based biofuels to meeting the EU target of renewable energy in transport by 2020 to 5 per cent from the current 10 per cent target. If the EU does not cut its current subsidies to biodiesel, it may, in an indirect way, lead to the cutting down of more rainforests, the conversion of more forest and peat land for palm oil plantations, and the emission of more carbon into the atmosphere.



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Annex I. Summary of the Quantitative Analysis

Based on qualitative research, the causation model that has been adopted for further quantitative analysis of the Oil World data has been developed in the way visually presented in Figure A1.

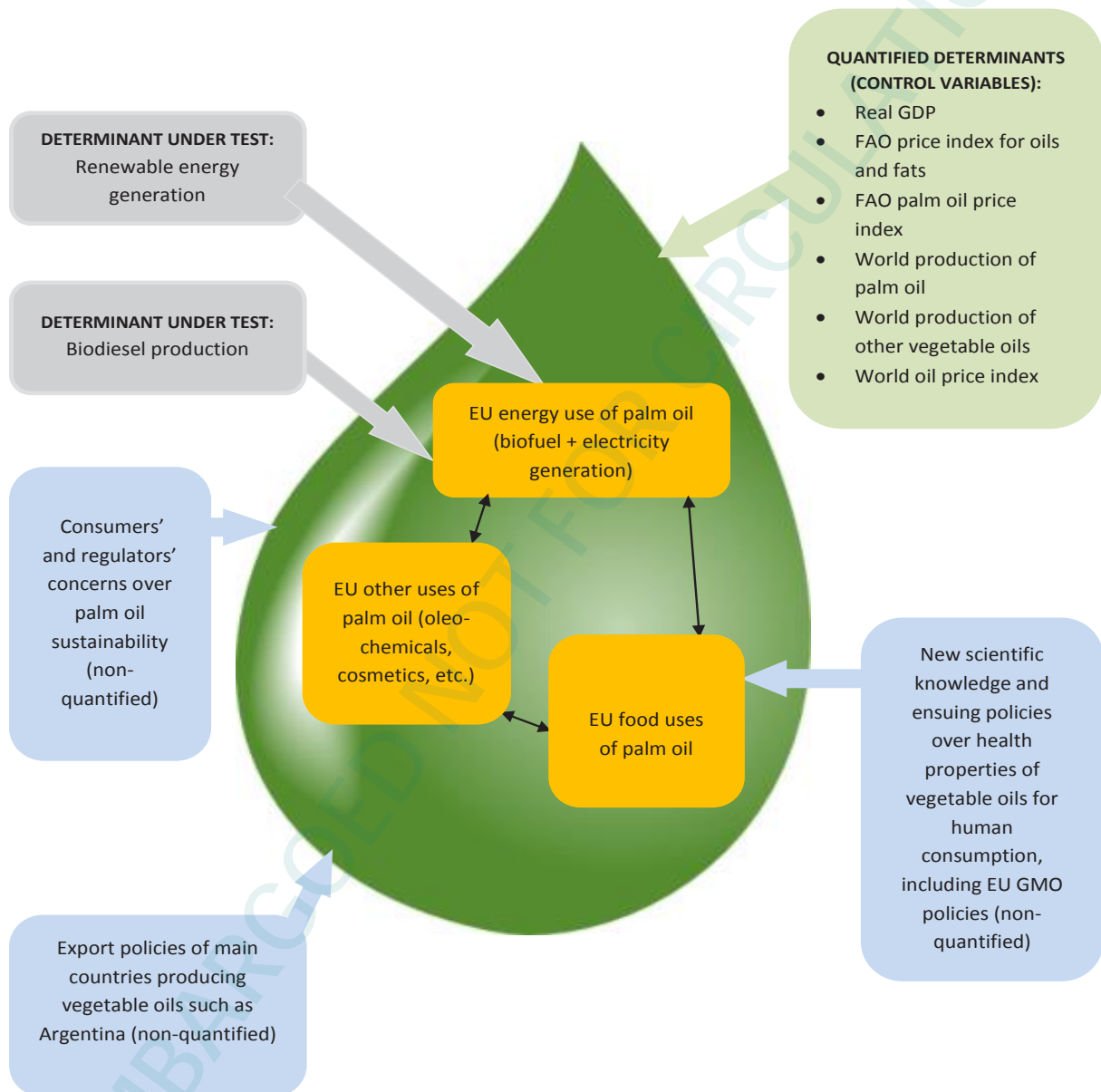


FIGURE A1: KEY DRIVERS OF PALM OIL USE IN THE EU

Source: IISD- GSI



The panel data for hypotheses testing consisted of Oil World estimates of end-use consumption of vegetable oils in the EU-27. The total number of observations was 108, based on time periods from 2006–2012 and 18 cross-sections: 16 EU countries (Germany, France, Netherlands, Poland, Hungary, Spain, Belgium, UK, Italy, Austria, Finland, Portugal, Sweden, Czech Rep, Denmark, Lithuania), rest of the EU, and the EU-27 in total. The following variables and their abbreviations in Eviews⁹ are listed below.

TABLE A1: VARIABLES AND THEIR ABBREVIATIONS

VARIABLES	VARIABLE NAME IN EIEWS	SOURCE
(i) GDP (in 2005 US\$)	(i) RGDP	(i) World Bank HDI
(ii) Palm Oil used in Non-Energy by the EU	(ii) PONE	(ii) Oil World Database
(iii) Palm Oil used in Biodiesel by the EU	(iii) POB	(iii) Oil World Database
(iv) Palm Oil used in Biodiesel and Energy/Heat by the EU	(iv) POBE	(iv) Oil World Database
(v) Biodiesel Produced by the EU	(v) BP	(v) Oil World Database
(vi) Renewable Energy Produced (000's tons of oil equivalent) by the EU	(vi) REP	(vi) Eurostat
(vii) Vegetable Oils used in Biodiesel and Energy/Heat by the EU	(vii) VOBE	(vii) Oil World Database
(viii) World Palm Oil Price (2005 US\$/metric ton)	(viii) RWPOP	(viii) World Bank Commodity Price Data
(ix) World Soybean Oil Price (2005 US\$/metric ton)	(ix) RSOP	(ix) World Bank Commodity Price Data
(x) FAO Oil Price Index (weighted with 2002-2004 trade basket)	(x) FAOOPI	(x) FAOstat
(xi) Brent Crude Oil Price (2005 US\$/metric ton)	(xi) RBCOP	(xi) World Bank Commodity Price Data
(xii) World Vegetable Oil Production except Palm Oil (Tons)	(xii) WVOPEXPO	(xii) FAOstat
(xiii) World Vegetable Oil Production without Palm Oil and Palm Kernel Oil (Tons)	(xiii) WVOPEXPOPKO	(xiii) FAOstat
(xiv) World Palm Oil Produced (Tons)	(xiv) WPO	(xiv) FAOstat
(xv) Real GDP in Year T – Real GDP in Year (T-1)	(xv) RLGDP	(xv) Generated from (i)

We use pooled OLS estimation for this panel due to data constraints (i.e., fixed-effects and random-effects estimators are not feasible due to the number of observations present).

For each of the hypotheses below, we will conduct robustness checks by: (i) correcting for heteroskedasticity and serial correlations across cross-sections (time clustered) (ii) correcting for heteroskedasticity and serial correlations within cross sections (cross-section clustered).

The intuition behind (i) is that the error terms may exhibit heteroskedasticity and serial correlations across time, for each cross section, hence the notion of time-clustered. Similarly for (ii), the errors within a cross-section may be heteroskedastic and serially correlated, hence the notion of cross-section clustered.

⁹ To avoid clutter in the regression output.



To correct for (i) we use White's (Period) Robust Covariance Estimator in Eviews and for (ii) we use White's (Cross Section) Robust Covariance Estimator. Pooled OLS command is the usual 'LS' command in the software.

Statistical significance will be defined at the 5 per cent level of significance, i.e., p-values lower than 0.05.

Regression Analysis Results

There is statistically significant evidence to reject the null hypothesis of Proposition 1 that there is no relationship between the production of biodiesel, and the consumption of palm oil in the EU biodiesel sector. Thus Proposition 1 remains valid: *"The more biodiesel is produced in the EU countries (excluding biodiesel from waste/used oil & fats), the more palm oil is consumed in the EU biodiesel sector"*

The correlation does not always imply causation, but the following characteristic of the relationship is observable: a unit increase in biodiesel produced in the EU (excluding biodiesel from waste/used oil & fats), corresponds to an increase by approximately 0.11 units of palm oil consumed in the EU biodiesel sector. It has to be noted, though, that biodiesel production in the EU actually decreased in 2010 and, though it increased in 2011 and 2012, it still did not return to the 2009 historic maximum in 2012—whereas palm oil consumption in the biofuel sector in Europe has been steadily increasing over the observed period.

There is statistically significant evidence to reject the null hypothesis of Proposition 2 that there is no relationship between the use of all vegetable oils for both biodiesel production and energy and heat generation in the EU, and the usage of palm oil for both biodiesel and energy and heat generation in the EU. Thus Proposition 2 remains valid: *"The bigger the use of all vegetable oils for both biodiesel production and energy & heat generation in the EU, the more palm oil is used for both biodiesel and energy & heat generation in the EU."*



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