European Policies towards Palm Oil – Sorting Out some Facts[*]

Why the Renewable Energy Directive is discriminatory against non-EU Producers of Biofuels

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Abstract

Biofuel use is increasing throughout the European Union. This increased use has raised some concerns about the environmental impact of these fuels. Of particular concern is palm oil, a biofuel derived from palm trees in tropical regions. This paper analyzes the many claims about palm oil's harmful environmental impact and finds them seriously flawed. In addition the paper analyzes questions of economic growth and development related to palm oil that are overlooked by the critics of palm oil.

Policymakers and the public, concerned about greenhouse gas (GHG) emissions from industrial use, have been seeking alternatives to carbon-rich fuels such as coal. Biofuels have emerged as an attractive alternative because they generate far fewer greenhouse gases than conventional fuels. As a result, many countries throughout Europe are eager to use palm oil and other biofuels for their electricity generation and transportation systems.

Palm oil is a low-energy and low-fertilizer crop that offers much higher yields per hectare than other oil crops. Furthermore, if the energy obtained by the residuals in the production process is used properly, the energy balance of palm oil production is much more favourable compared to other biofuels. Overall, palm oil turns out to be much more efficient than other oil crops and therefore offers significant advantages within the context of GHG savings.

Contrary to some recent campaigns and the perception among some European citizens, deforestation associated with oil palm plantings is much less significant than postulated. Indeed, the European Commission is considering classifying palm oil plantations as forests due to the excellent crown cover they provide in the regions they are established. Furthermore, biodiversity in oil palm plantations is much higher than in most monocultures in the EU.

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Palm oil is an important driver of economic development and growth in tropical countries and contributes to the reduction of poverty and hunger in the developing world.

The EU Renewable Energy Directive is discriminatory from the outset and the GHG saving values and their interpretation are based on wrong assumptions and faulty calculations. For example, under the Directive biofuel producers in the European Union are permitted to claim higher GHG savings than biofuel producers outside the EU. This is protectionism and clearly in violation of established international trade laws. It is particularly problematic since any reasonable emissions budgeting comparison shows that palm-derived biofuel is less carbon-intensive than those produced elsewhere, including Europe.

The EU should reshape its policies towards palm oil, conduct objective and non-discriminatory calculations regarding the GHG emissions saving values and support palm oil imports from developing countries rather than restricting them. Together with certain initiatives to further enhance energy efficiency and to protect precious habitats combined with strategies to strengthen property rights and encourage efficient land use and successful strategies of agricultural development, this would not only prevent political conflicts and trade disputes in conjunction with the issue of palm oil but also foster economic growth and development, reduce poverty and - not least - contribute to the ambitious GHG emissions savings goals on a fair and reasonable basis.

JEL Code: F14, F18, O13, Q01, Q15, Q27, Q56, Q57

1. Introduction

The discussion of climate change has gained momentum in recent years and the phenomenon is now seen as one of the most important threats for the environment. Climate change is expected to cause a wide range of environmental and socio-economic problems. Although our ability to quantify the precise impact of human activities - especially carbon emissions - on the global climate is very limited because of the complexity of patterns of long-term natural variability, the majority of climate scientists agree that the climate is changing and will change with a higher magnitude in the next decades not least because of anthropogenic greenhouse gas (GHG) emissions.

That is why the international community is desperately looking for effective and efficient ways to deal with the threat of climate change. The Kyoto Protocol, a protocol to the United Nations Framework Convention on Climate Change, which was adopted in 1997 came into force in 2005 was the first step of coordinated international action to reduce GHG emissions over the five-year period 2008-2012. As of October 2009, 184 states have signed and ratified the protocol.

For quite a while biofuels have been perceived as a possible saviour of environmental and energy problems in the world and initiatives have been implemented in order to support biofuels. However, in recent times biofuels have been rather deemed to be worse than the problem. Palm oil has been on top of the agenda. Campaigns initiated by environmentalist lobby groups like Friends of the Earth and Greenpeace have been arguing against palm oil as a source for biodiesel and in general. In particular, these campaigns suggest that the palm oil industry causes deforestation and contributes to GHG emissions as well as a loss of biodiversity in the tropical world. These campaigns have been quite successful in shifting public perception and government attitudes regarding biofuels (Karmee 2005). In the course of this shift and lobbyist pressure from European farmers, the EU announced certain preconditions for "sustainable" biofuels in the Renewable Energy Directive (RED) "On the promotion of the use of energy from renewable sources and amending and subsequently repealing" that limit the use of palm oil based biofuels within the European Union (EU 2009). Although the primal proposal to ban soy- and palm-based biodiesel in general has not been supported in the European Commission's review, and was eventually dropped, measures against palm oil still remain in the GHG emission saving default value (Schill 2009) and the availability of palm oil products in the EU is restricted.

What is rather missing in the current discussion of palm oil is the development perspective. World hunger is projected to reach a historic high in 2009 with more than one billion people going hungry every day. Almost all of the world's undernourished live in developing countries in tropical areas. In Asia and the Pacific, an estimated 642 million people are suffering from chronic hunger and in Sub-Saharan Africa 265 million (FAO 2009). Many of the world's poor and hungry are smallholder farmers in developing countries. Yet they have the potential not only to meet their own needs but to boost food security and catalyse broader economic growth. With no doubt, agricultural development in the developing world is the only sustainable way out of the misery of poverty and hunger and could be a major contributor to higher incomes for the rural poor and subsequent economic growth and development. Plant oil is already an important pillar of rural development in some tropical countries and a major generator of jobs and prosperity. Palm oil as the most prominent plant oil offers great opportunities not just for South-East Asia but also for Sub-Saharan Africa.

This paper analyses the role of palm oil and its sustainability from different perspectives. First, we consider the role of palm oil within the GHG context. Second, we discuss the impact of palm oil on biodiversity. Third, we analyse how palm oil can contribute to economic growth and development in tropical countries. Finally, based on this analysis, we assess the current concerns about and politics towards palm oil with special focus on the EU.

2. The Greenhouse Gas Emissions Issue

Although just a minor part of the crude palm oil (CPO) produced in tropical world is used as a feedstock for biofuels, the issue of carbon emissions reduction due to palm oil based biofuels has become a major concern in the current discussion. The question has been raised if palm oil based biodiesel is sustainable with respect to its "carbon footprint" or not. Consequently, one major precondition for considering biofuel as sustainable and eligible for the purposes the EU 2020 targets (compulsory blending of fossil fuels with biodiesel) is that the greenhouse gas emissions using the respective biofuel will be reduced by 35% compared to the alternative fossil fuel use (EU 2009).

In order to calculate the GHG impact of biofuels a life cycle analysis including all activities associated with the production of the respective biofuel has to be done. Due to serious measurement problems and uncertainties in such life cycle analyses, the results of scientific studies regarding the carbon footprint of palm oil based biofuel are far from conclusive. Furthermore, since the actual reduction of carbon emissions due to the substitution of fossil fuels is the key question, comprehensive life cycle calculations for the use and the production fossil fuels have also be taken into account.

There is a remarkable difference between the calculation of carbon reduction performance of palm oil based biofuel by the EU and a range of scientific studies. In calculations by the EU, the carbon reduction by palm oil based biofuels fail the given threshold of 35 percent under certain assumptions whereas quite a few studies yield very different results. Why is that so?

2.1. Calculations by the EU – discriminatory from the outset

According to the Renewable Energy Directive, it is possible to use the actual calculated value of GHG emissions[1], whereas the calculated annualised greenhouse gas emissions from carbon stock change due to land-use change (Part C Annex V) must be significantly above

[1] Methodology laid down in part C Annex V of the Directive (EU 2009).

zero. In cases where the calculation of GHG emission savings is not provided by the fuel distributor – which is very likely for most imports from developing countries – fixed values for each biofuel production pathway must be taken into account instead. For many member states using default values is a preferred option in order to minimize work load. Again, these values are only allowed to be used when the raw materials are cultivated outside the EU (Eickhout et al. 2008).

According to the Renewable Energy Directive, only biofuels that will reduce GHG emission by 35% compared to the alternative fossil fuel use is deemed as biofuel for the purposes of meeting compulsory blending targets.[2] The key protective element of the EU-Directive (and German biomass-electricity-sustainability ordinance) is that members of the European Union can rely on the *typical value* (which is higher than the default value) while for exporters from outside the EU the *default value* will be presumed. In part A of Annex V of the EU-Directive the values for biofuels are given; divided into *typical* (average production standard) and *default* values (worst case production standard).[3] While for sugar beet ethanol and rape seed biodiesel – with the latter one being produced mainly in the EU – the typical and default values are set at 61% (typical) vs. 52% (default) and 45% vs. 38%, respectively. The values for sunflower biodiesel are assumed to be 58% vs. 51%.

The value for palm oil biodiesel, however, has been set at 36% (typical) vs. 19% (default) if the methane by-product is not captured in the production process. If the methane is captured, the values for palm oil biodiesel are 62% (typical) vs. 56% (default). To rely on these values, the exporting country must prove that the freight is completely produced by oil mils with methane capture, which should be nearly impossible for every single tonne of a 70,000-tonnes tanker. Given the distinction between default and typical value and the discrimination between EU members and non-members, palm oil exporters EU will fail the target whereas palm oil producers within the EU would not because they could rely on the typical value which just exceeds the given threshold. However, since there literally no production of crude palm oil in the EU, the latter case is rather academic.

Hence, just the fact that palm oil producers are not members of the EU prevents them from meeting the defined target of carbon reduction.[4]

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2 In Germany, these conditions are also required to benefit from the enhanced payment for producing biomass-electricity according the Renewable Energy Sources Act (Bundesanzeiger 2004).

3 The German biomass-electricity-sustainability ordinance requires the same methodology for calculating the value of GHG emissions and, as substitute if the exporter is not able to provide this calculation, the same fixed default values as the EU (Bundesanzeiger 2009, Chapter 2).

4 Furthermore, it is questionable why the differential between typical (average production) and the default value (environmental worst case production) is 85.2 percent for sugar beet ethanol (61% vs. 52%), 84.4 percent for rape seed biodiesel (45% vs. 38%), and 87.9 percent for sunflower biodiesel (58% vs. 51%), but for palm oil biodiesel (process not specified) the assumed default value reaches 50 per cent of the typical value only (36% vs. 19%).

2.2. Comprehensive calculation of GHG impact of biofuels

2.2.1. Reference value for fossil diesel

First of all, the reverence value for the GHG emission savings, the average CO2 emission resulting from the combust of fossil diesel, is problematic, since the CO2 emissions from the extraction of these fuels have to be taken into account and these emissions vary depending on the very process. The EU (2009) sets the reference value for GHG emissions from fossil fuel at 83.8 gCO2eq/MJ.

Table 1 summarizes the emissions generated in the production phase of European diesel, as calculated by recent studies. Given these figures, the total emissions in the life cycle of fossil diesel vary between 83.3 and 87.3 gCO2eq/MJ (73.1 kg gCO2eq/MJ for direct combustion). The EU reference value for GHG emissions is close to the lower bound of this range and therefore rather underestimating the carbon savings of biofuels.

Table 1: GHG emission from production, transport and distribution of fossil diesel (without direct emissions from combustion)

Source	Silva et al. 2006	CONCAWE and EUCAR 2006	GM et al. 2002
gCO2eq/MJ diesel	14.2	14.2	10.2

It should be noticed that the values given above do not take into account the exhaustibility of crude oil reserves. Future extraction of fossil oil is likely to cause substantially higher GHG emissions than the EU reference value. For example, the extraction of oil from bituminous sands, widely spread especially in Canada, requires large quantities of steam and the fuel produced using these resources is expected to cause about 50% more GHG emissions compared with the extraction and use of conventional crude oil. Similarly, with almost a third of the coal's chemical energy loss in terms of waste heat in the conversion process, the coal-to-liquid process technology, which is seen as an alternative to conventional oil resources, is also less efficient. Furthermore, also the future extraction and use of the remaining conventional oil reserves will produce higher GHG emissions than today, owing to the smaller size and geographic inaccessibility of the remaining productive fields (Cockerill and Martin 2008).

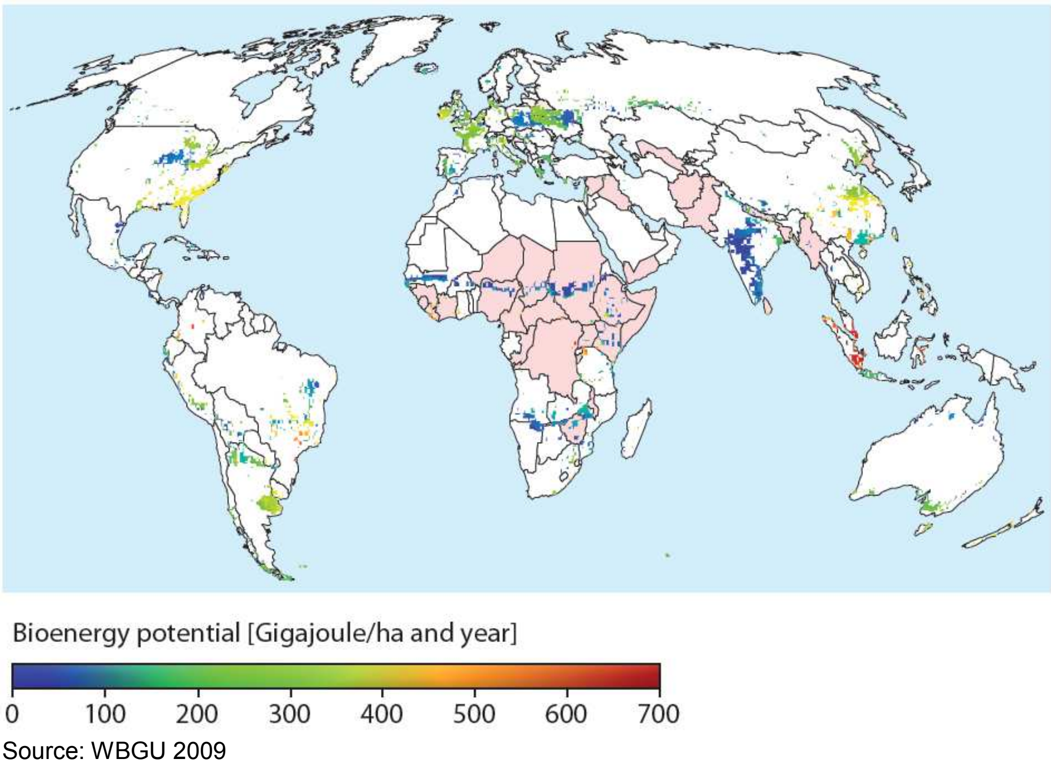
Even if these considerations are not taken into account, the comparably low carbon reduction performance of palm oil based biodiesel predicated by the EU is highly questionable. According to scientific studies, palm oil appears much more efficient as a feedstock for biofuel than other oil seeds such as rapeseed. The reasons for that are the substantially higher yields of palm oil per hectare compared to other oil crops, the fact that palm oil is a low energy and low fertilizer input crop and that the energy obtained from the palm residuals exceed the actual energy demand in the extraction and production process. We will discuss these issues in the following parapgraphes.

2.2.2. Yields of oil crops

Regarding the source, efficient energy crops should have high percentages of oil, high yields per hectare and low production costs (Pinto et al. 2005). Taking this into account, biofuel production will likely be environmentally benign and most profitable in tropical areas with longer growing seasons, higher per acre biofuel yields, and lower fuel and other input costs (Coyle 2007). According to studies done by the OECD (Doornbosch and Steenblik 2007) and the German government (BMU and BMELV 2009), biomass feedstock can be most efficiently produced in tropical regions, where suitable land is mostly concentrated, and annual yields are highest not least because of the higher solar insolation. For instance, the high photosynthesis rate enables the oil palm to produce up to ten times more oil per hectare per year compared to annual oilseeds such as rapeseed or soybean (Basiron 2007).

Hence, the German Advisory Council on Global Change concludes that "perennial crops such as Jatropha, oil palms, short-rotation plantations (fast-growing timber) and energy grasses score better than annual crops such as rape, cereals or maize" and that "the former group should therefore always be preferred" (WBGU 2008, pp. 6). As a consequence, tropical areas provide much better conditions for the cultivation of certain energy crops than most regions in the northern and southern hemisphere further away from the equator (see Figure 1).

Figure 1: Energy potential due to energy crop cultivation in 2050

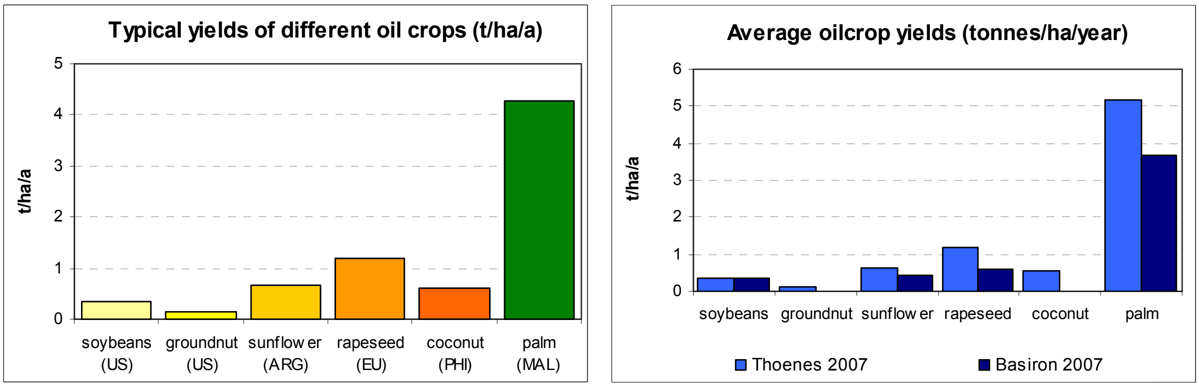


Source: WBGU 2009

The countries coloured pink are areas in political crisis where there is little prospect of exploiting bioenergy potentials in the short to medium term. The global bioenergy potential is 80-170 exajoules per year, which is around one-tenth of the anticipated global energy requirement in 2050 (WBGU 2009).

A study by Thamsiriroj and Murhy (2009) shows that palm oil from tropical countries, such as Thailand, offers great advantages over European liquid biofuels. This is primarily due to the high palm oil yields per hectare which could reach 20 tons of fruit per year compared to less than 5 tons seed in the case of rapeseed. Even if conservative figures for the efficiency of the extraction process are considered, palm oil by far outperforms rapeseed and other oilseeds in the actual yield of crude plant oil per hectare (see Figure 2 and Table 2).[5]

Figure 2: Typical yields of oil crops



Source: Thoenes 2006 — Source: Basiron 2007, Thoenes 2007

Table 2: Production yield and energy output rapeseed vs. palm oil

	Rape seed	Palm oil
Yield of seed, fruits	4.11 t/ha/a	18.35 t/ha/a
Oil available from process	30%	17.7%
Yield of plant oil	1.23 t/ha/a	3.25 t/ha/a*
Yield of biodiesel	1 L/L oil	0.944 t/t oil
Yield of biodiesel	1.19 t/ha/a	3.07 t/ha/a
Gross energy of biodiesel (biodiesel energy value: 39 GJ/t)	46.5 GJ/ha/a	119.6 GJ/ha/a
Total parasitic energy	21.21 GJ/ha/a	45.35 GJ/ha/a
Net energy of biodiesel	**25.29 GJ/ha/a**	**74.23 GJ/ha/a**

Source: Thamsiriroj and Murhy (2009)

* The gross energy of crude palm kernel oil is not included in this estimation. If the yield of CPKO was included, the total yield of palm oil would increase by 14% to 3.71 t/ha/a.

[5] Thamsiriroj (2007) finds yields of 3 570 L/ha/a for palm oil compared to 1 350 L/ha/a for rapeseed oil.

Results from the technical analysis in the current study by Thamsiriroj and Murhy (2009), indicate that biodiesel produced from imported palm oil from Thailand provides a much higher gross and net energy than Irish rapeseed. After all, the net energy is almost 300% higher for biodiesel produced from imported palm oil: Palm oil offers a net energy of 74.2 GJ/ha/a compared to 25.3 GJ/ha/a for rapeseed (see Table 3).[6] Consequently, palm oil has the lowest per unit production costs of all vegetable oils (Thones 2006).

The results found by Thamsiriroj and Murhy (2009) and other studies imply that the net GHG emissions released from the palm oil system are significantly lower than for the rapeseed system (39.2 gCO2eq/MJ compared to 62.2 gCO2eq/MJ).

As in the EU Directive (2009) Annex V (C), GHG emissions reductions are calculated as follows:

$$SAVING = (E_F - E_B) / E_F\ ;$$

where E_B is the total emission from the respective biofuel and E_F is the total emissions from fossil biodiesel.

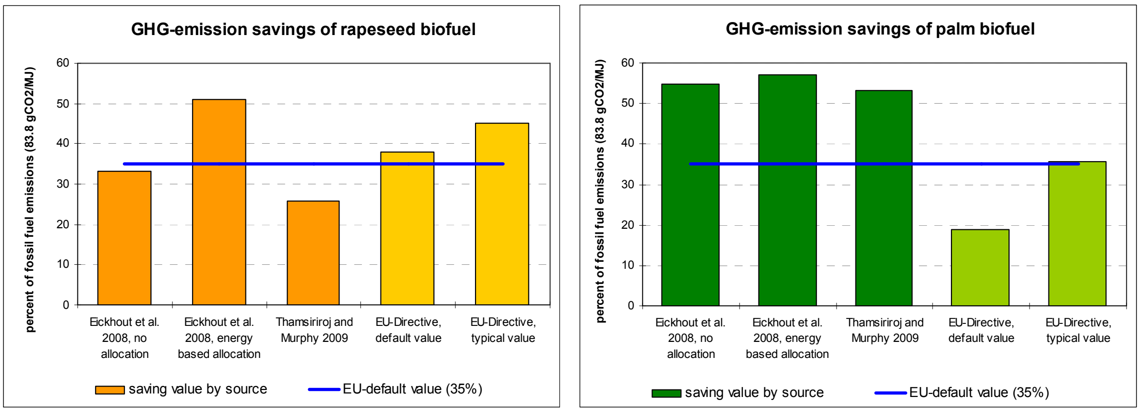
Calculating the savings in the same manner (compared to the total emissions of conventional diesel with 87.3 gCO2eq/MJ; allowing for extraction, transport and refining of the fossil fuel), GHG reductions resulting from the use of biodiesel generated from Irish rapeseed are 29% compared to 55% in the case of Thai palm oil. If compared with the lower EU reference value for total emissions of fossil diesel (83.8 gCO2eq/MJ), GHG reductions resulting from the use of palm biodiesel are 53% and reductions from rapeseed biodiesel are 26% respectively. Obviously, these values for GHG reduction of palm oil based biodiesel are much higher than the EU-Directive default value of 19%. Furthermore, the figures indicate that contrarily to the EU, European (Irish) rapeseed does not achieve the criteria of the proposed EU Directive, which requires a 35% greenhouse-gas reduction when substituting for fossil fuels. Palm oil biodiesel clearly does, as it far exceeds the 35% default value.

Other studies also obtain much higher GHG emission savings for palm biodiesel. For example, Eickhout et al. (2008) analyses the sustainability criteria for biofuels as formulated in Article 17 of the EU-Directive. Compared with their estimation results (originally done by Hamelinck, 2007), the GHG saving EU-default values for first generation biofuels produced within the EU are overestimated, and, in contrast, are by far to low for (mainly) imported biofuels. For example, according to the Directive, sugar beet ethanol is displayed with 52% GHG savings and rapeseed biodiesel with 38%; both produced in EU member states. Contrarily, much lower values are assigned by the EU-Directive for soybean biodiesel with 31%, and palm oil biodiesel with 19%, both produced only outside the EU (see EU 2009, Appendix V). Hence, soybean and palm biodiesel failed the 35% requirement. As a consequence, imports of these biofuels are heavily restricted.

[6] It should be noticed that Thamsiriroj and Murhy (2009) estimate these values very conservative, as they expect for the palm oil a transport distance of over 14,000 km (distance Thailand – Ireland) and a road distance of 1000 km from the palm oil mill to Thailand's international harbour (by truck). Therefore, energy used for transportation in the case of palm oil is considered to be much higher (50 times) than for rape seed.

In addition, the EU default values for the second generation biofuels are also fairly high compared to the estimated values by Eickhout et al. (2008) which indicates a further distortion of the performance assessment by the EU. However, in the analysis done by Eickhout et al. (2008) it is not visible that second generation biofuels yield better results than first generation biofuels, since the entire production chain is not considered in the EU-Directive. The great advantage of first generation biofuels over second generation biofuels is that these biofuels also yield by-products that can be used as feed for animals, or solid fuel.

Figure 3: GHG emissions savings of rapeseed and palm oil biodiesel



Overall, a comparison of scientific studies calculating GHG emission values of palm oil biodiesel with the EU values shows a huge gap between the derived values. In the figures below, we used the rather low EU GHG emission value of fossil diesel. As Figure 3 clearly shows, GHG-emission savings for palm oil estimated by scientific studies are much higher than the typical and default values of the EU-Directive. For rapeseed the contrary is visible. This clearly indicates "political varnished" EU default values for the respective plant oils. This is not least due to the fact that the EU has neglected some important aspects in calculating the GHG saving ratios; for instance – among others – the impact of fertilizers and the use of parasitic process energy. Both issues will be discussed below in detail.

2.2.3. Fertilizers

Another reason for the efficiency gap between palm oil and other oilseeds is the agricultural process. In the case of palm oil the production involves picking fruit lets annually from a tree for up to 30 years of life time of the palm, compared with the more energy intensive rapeseed process that requires annual ploughing, fertilizing, sowing and harvesting of rapeseed which must be grown in rotation. Therefore, rapeseed can be referred as a high-energy input crop offering yields only one year in five because of crop rotation, while the oil palm is a low-energy input crop offering yields every year (Thamsiriroj and Murhy, 2009).

Especially when accounting for the use of fertilizers, a much more advantageous light is drawn on palm oil compared to other oil seeds. Fertilizers are a highly relevant source of GHG emissions. The agricultural phase is responsible for a relevant share of GHG emissions largely due to the emissions of nitrous oxide (N2O), other nitrogen gases (i.e. Nox) and Sox associated with the use of fertilizers (Menichettia and Otto, 2009).

As Table 3 shows, the use of nitrosamine fertilizers to harvest one hectare rape seed in the EU (e.g. Poland) is 50 per cent higher than the average fertilizer input to farm one hectare oil palm plantation in Indonesia (147 kg/ha vs. 95 kg(ha). At the same time, the yield of one hectare palm plantation is nearly three times higher than the yield of a respective rapeseed field (3.25 t/ha/year vs. 1.23 t/ha/year). This results in a four times higher input of fertilizers for one unit of rapeseed based biodiesel compared to palm oil (see last column in Table 3).

Table 3: Fertilizer input in the production of crude oil

Oil plant	Fertilizer use (N in kg/ha)	Yields of plant oil (t/ha/year)	Yields of biodiesel (t/ha/year)	Fertilizer use per produced unit of biodiesel (N in kg/t)
Palm oil	95.00	3.25*	3.07	**30.9**
Rape	147.00	1.23	1.19	**128.0**

Source: Own estimations. Values for fertilizer use of respective crops by FAO (2009). Values for production yields and gross energy by Thamsiriroj and Murhy 2009.

* Note: The gross energy of crude palm kernel oil (CPKO) is not included in this estimation, since this is a high quality oil, used only in the food and cosmetic industry. If the yield of CPKO was included, the total yield of palm oil would increase by 14% to 3.71 t/ha/year.

Nitrosamine fertilizer use will lead to additional N2O emissions, which is the most potent GHG. This, indeed, increases the GHG footprint of any fertilizer intensive oil seed and can dramatically reduce the respective GHG savings. The Intergovernmental Panel on Climate Chance (IPCC) estimates that 1 kg of N2O has the same effect as 298 kg of CO2 emissions over a time horizon of 100 years (Solomon et al. 2007).[7]

As a consequence, even small changes in the nitrosamine fertilizer use and therefore the rate of N2O emissions can significantly affect the overall GHG emission saving results for biofuels (Menichettia and Otto 2009). Maybe even more important in the long run, scientific research suggests that N2O emission is currently the single most important ozone-depleting substance emission and is expected to remain the largest throughout the 21st century; exceeding the ozone layer destruction potential of chlorofluorocarbon (CFC) to a great extent. Limiting future N2O emissions through fertilizer use would enhance the recovery of the ozone layer from its depleted state and would also reduce the anthropogenic forcing of the climate system (Ravishankara et al. 2009).

[7] The EU Renewable Energy Directive sets a value of 296 CO2 equivalent units for N2O emissions.

Additionally, the nitrate fertilizer production from ammonia is made by the energy-intensive Haber-Bosch process. Moore (2008) suggests that this is the largest single consumer of fossil fuel energy in the agricultural process. Contrarily, the palm residues (fibres, shells) contain high nutrient value. Based on nutrient content estimations (Mohd 1993), an equivalent energy of 683.2 MJ could be saved from the production of chemical fertilizers if these residues are used as fertilizers (Yusoff, 2006). Thamsiriroj and Murhy (2009) conclude that rapeseed requires 55% more energy to grow than oil palm. As displayed above, this is mainly due to the fact that oil palm is a perennial which requires much less energy intensive fertilizers.

This highly relevant issue is not correctly considered in the EU default values and the use of fertilizers is not explicitly incorporated in the calculation method proposed by the directive. In fact, the issue is rather neglected in the estimation methodology as required in Appendix V © of the EU Directive. This methodology is strictly promoting rapeseed based biofuels with a four times higher need for nitrosamine fertilizers. In contrast, biodiesel from (perennial) oil palms do need only a fractional amount of fertilizers as they have a lesser nitrogen demand (and have more benign impacts on soil quality) to yield higher output at the same time than annuals such as maize or rape (Peskett 2007; Crutzen et al. 2008); not least because of the higher amount of insolation in tropical areas (Doornbosch and Steenblik 2007).

Given the figures for fertilizer input, the current EU regulation clearly favours fertilizer intensive crops such as rapeseed compared to palm oil. However, an exact analysis of the agricultural process – and the fertilizing efficiency in particular – shows that palm oil is obviously outperforming rapeseed in this dimension, both in ecological and economic terms.

2.2.4. Parasitic energy

Most of the oil palm residues can be used to meet all parasitic energy demands (especially for transesterification) during the production process. Therefore, hardly any fossil fuels are necessary for the production process. One major shortcoming in the EU-Directive is the fact that the impact of parasitic energy in the production process (oil mill, transesterification) of the respective biofuels is not considered at all. This shortcoming is another explanation for the low GHG emission saving default values of palm oil calculated by the EU. Again, from a scientific perspective an environmental life cycle assessment is requires, considering parasitic process energy. The type and quantity of process energy used in the production process can significantly the overall GHG reduction performance.[8]

Extraction of any form of biofuel is energy intensive. In the case of palm oil, energy demand can be met utilizing palm oil processing wastes which is used to replace the input of fossil fuel in palm oil milling and biodiesel production (Yusoff 2006, Reijnders and Huijbregts 2008).

8 As reported by Wang et al. (2007) and Menichettia and Otto (2009) in case ethanol fuel from sugar cane, the quantity and type of process energy used can significantly affect the overall results.

Through the cogeneration of electricity that displaces coal-fired or other electricity from the grid the savings could reach and even exceed 100% (Doornbosch and Steenblik 2007).[9]

Yusoff (2006) describes the efficient use of biomass as the first of the renewable energy sources to be developed for large-scale applications, especially in the palm oil industry. Palm press fibre (PPF) and palm kernel shell (PKS) generated by the palm oil mills are traditionally used as fuel to generate steam and electric energy (via steam run generators) required for the operation of the mill with surplus energy left over. The dry calorific values are 18.6 GJ/t and 20.8 GJ/t for PPF and PKS, respectively. These two solid fuels alone are able to generate more than enough energy to meet the energy demands of a palm oil mill (Yusoff 2006). In addition, the empty fruit branch (EFB) can also be used to generate power, but has to be shredded and dehydrated to a moisture content below 50% making it more easily combustible. At 50% moisture, EFB has an additional heat value of about 8,2 GJ/t (Jorgensen 1985).

An improvement of the production process could involve a further use of biogas from anaerobic digestion of palm oil mill effluent (POME). By now, biogas from POME is produced in an increasing number of palm oil mills. This is combined with a reduction in the amount of methane emitted from oil palm processing waste water. Methane production (via fermentation plant) from such waste water can be controlled and burnt for energy production (Borja and Banks 1994; Hassan et al. 2005, 2006; Najafpour et al. 2006). The biogas generated from 1 ton of EFB is estimated at 19.6 m^3 with a calorific value of 22.9 MJ/m3 (Yusoff 2006). Thus, total biogas energy from 1 ton of EFB is 448.8 MJ.

Table 4: Energy credit from oil palm residues

	Palm Press Fibre (PPF)	**Palm Kernel Shells (PKS)**
Quantity available from mill	140 kg/t FFB	65 kg/t FFB
Quantity/ha (EFB = 18.35 t/ha/a)	2.57 t/ha/a	1.19 t/ha/a
Energy value	11,324 kJ/kg (65% dry)	17,516 kJ/kg (90% dry)
Energy credit provided	29.09 GJ/ha/a	20.89 GJ/ha/a
Total energy credit provided	49.98 GJ/ha/a	

Source: Mahlia et al. 2001, Thamsiriroj and Murhy (2009).

[9] An increasing use of the additional energy provided by palm mills is more and more common and should be further developed. For example, a target by the Malaysian Government is that renewable energy should play a major role (70%) in meeting the needs of prime energy demand. Presently, renewable energy represents 5% of all Malaysian prime energy use, but by the year 2060, it is strongly predicted that it will reach 70%. According to Yusoff, this target is very realistic considering the huge quantities of oil palm waste in the country and the existence of over 300 palm oil mills that are operating using solid waste from palm trees and the palm oil industry has experience of more than 40 years in operating biomass cogeneration systems and – moreover – the use of oil palm waste for heat and power generation in the country (Ma 1999).

Thamsiriroj and Murhy (2009) assess the values for processing energy on the basis of the requirements and output of processing the annual yield of one hectare palm oil plantings. During processing, 1 ton of empty fruit branch (EFB), 140 kg of palm press fibre (PPF) and 65 kg of palm kernel shell (PKS) are generated (TMB 2006) per hectare. Taking only the energy provided by PPF and PKS into account, as these residues are used by all palm mills at least; a total of 50 GJ/ha/a renewable energy is available from residues (Mahlia et al. 2001; for exact values see Table 4).

Table 5: Parasitic energy for palm oil milling process

Yield of EFB:	18.35 t/ha/a
Primary energy required for mill:	39.64 GJ/ha/a (2160 MJ/t EFB)
Efficiency of electricity generation:	4%
Parasitic energy for electricity:	1.59 GJ/ha/a (24 kWh/t EFB)
Energy content in exhaust steam:	68% of primary energy
Parasitic energy for steam:	26.95 GJ/ha/a (1468.8 MJ/t EFB)
Overall efficiency of co-generating system:	72%

Source: Thamsiriroj and Murhy (2009).

PPF and PKS are combusted, steam is produced in a boiler; the steam is then used to generate electricity, and utilized in the milling process. Using conservative values, electricity is generated at an efficiency of around 4%, while the exhaust steam provided to the milling process contains 68% of the energy input (Matsushita and KIT 2003). The milling process requires significantly less electricity than steam. As also stated above, the energy produced from the residues is much higher than the energy required in the milling process[10]; thus, no conventional fuel is required when the mill is in operation (Thamsiriroj and Murhy 2009)[11]. To supply security lighting and domestic supply when the mill is not in service, a palm oil mill may install a diesel generator (Yusoff 2006); however, this energy is not considered as significant. For the transesterification process the parasitic process energy demand is comparably low (about 2%).[12] Obviously, the issue of parasitic energy *must* be considered in the analysis of the respective biofuel production. Neglecting the parasitic process energy – as done in the EU-Directive – turn the efficiency values of palm oil versus rape seed upside down.

10 Compared per hectare, the parasitic energy required for processing palm oil is higher than that for rape seed oil, as the per hectare yield of palm oil is higher (Thamsiriroj and Murhy 2009).
11 For the oil extraction process of the yield of 1 hectare rape seed a parasitic energy demand of 2.32 GJ/ha/a is calculated. The parasitic energy used is relatively low (5% of gross energy) as the process is simple, but the process energy is – in most cases – received from the grid (see Thamsiriroj and Murhy 2009).
12 This value is a constant in biodiesel production, regardless of the sourced oil seed.

2.3. Summarizing the results of the GHG emissions issue

Altogether, the analysis shows that the GHG saving ratios postulated by the EU are highly distorted and derogatory to palm oil.

First, all reliable data clearly show that oil palm plantations reach significantly higher yields per hectare than other oil crops such as rapeseed. Therefore, regarding yields, palm oil is per se much more efficient and sustainable than the oil crops heavily supported by the EU and the US. The net energy extracted from oil palm is much higher than the energy obtained from rapeseed and other oil seeds grown in temperate zones. Even if very conservative figures regarding the transportation of palm oil from South-East Asia to Europe are considered, palm oil biodiesel clearly outperforms European rapeseed in every reasonable economic and ecological dimension.

Second, the EU Renewable Energy Directive does not take the issue of fertilizers into account. As shown above, nitrosamine fertilizers can seriously affect the climate balance of agricultural activities because they are associated with the emission of nitrous oxide (N2O), the most effective greenhouse gas. Since oil palm plantings need much less fertilizers than annuals like rapeseed, they create just a minor fraction of the according emissions over their 30 years lifespan. That is why oil palms are – from an ecological and economic perspective – even more advantageous compared to rapeseed and other oil crops.

Third, since the oil palm residues can meet all parasitic energy demand in the extraction and production process and energy obtained by using these residues may even exceed this energy demand, no additional energy from fossil sources is required in the production process at the mills if production structures are designed properly and energy is used efficiently. Palm oil mills could even contribute to the energy supply if process steam of mills is used in neighbouring factories. An efficient design and localization of palm oil mills could further contribute to the energy efficiency of the whole process and further enhance the climate balance of palm oil production.

Given these facts the default values and current policies by the EU must be referred to as blurred, discriminatory and – overall – harmful to palm oil producers in the developing world and – not least – to the ambitious GHG emissions saving goals. So, one could suppose that there are other reasons for such targets, namely the prevention of “undesirable imports” of more efficient produced – and consequently cheaper – biofuels from tropical regions. Hence, it seems that the Renewable Energy Directive is an example of import protectionism via environmental standards rather than an appropriate and effective measure to actually save the environment and contribute to GHG emissions savings.

3. The Biodiversity Issue

The second requirement of the EU Renewable Energy Directive for sustainable biofuels is that "there should be no damages to sensitive or important ecosystems while cultivating energy feedstocks". This requirement has the ambition preventing a situation where biofuels will be sourced through the replacement of virgin rainforest or peatlands. Biofuel production should not be accompanied with the destruction of primeval forest releasing sequestered carbon dioxide, both from biomass and in soil (which are tilled and thus disturbed), fertilizers or on the destruction of biodiversity (Thamsiriroj and Murhy (2009). This criterion is driven by the concerns of environmentalist groups. Hence, in lot of such publications, the demand for vegetable oil is widely incriminated as a contributing factor to environmental degradation in developing countries in the tropical world (e.g. van Geldern 2004; Friends of the Earth 2006; EPEA 2007, Reijnders and Huijbregts (2008). Indeed, the EU Renewable Energy Directive is somewhat problematic in definition. It limits biofuels "made from raw materials obtained from land with high biodiversity value … [or] a high carbon stock", defined in the following as "wetlands […] continuously forested areas … [and] peatlands" (EU 2009, Article 17). Such definitions pave the way towards discrimination. There are no details on how these specific requirements were reached, and "wetlands" and "continuously forested areas" are very vague definitions; "highly biodiverse grassland" could be "(i) natural […] or (ii) non-natural" (EU 2009, Article 17), and the like (see also Legge 2008).

A review of the environmental impact of oil palm plantations done by Henson (1999) concludes that such cultivation, in general, poses little direct environmental threat per se. Indeed, biofuel produced from deforested peatlands or tropical forest lands may cause environmental problems, like large carbon debts and a loss in biodiversity (Fargione 2008). The EU recognizes that each biofuel must be assessed on its own merits including the impact of land use change (Cockerill and Martin 2008). However, are the concerns of deforestation and habitat loss because of oil palm plantations actually eligible? Well, let's look at some figures.

In Indonesia, the area of oil palm plantings increased by 4.4 million ha to 6.1 million ha between 1990 and 2005, while total loss of tropical forest was 28.1 million ha. Hence, conversion of rain forest to oil palm plantations could account for at most 16% of recent deforestation (Fitzherbert 2008) and this only if all oil palm would have been planted on former forest land. This is – by all means – simply not the case. Oil palms are often cultivated on land that had been previously degraded by lumbering due to timber production, fire and logging (Casson 2000; Fold 2000; Curran et al. 2004, Dennis et al. 2005) and quite a few palm oil plantations emerged on existing agricultural land. More precisely, it has been estimated that only 1.7 to 3.0 million ha of forest were lost to oil palm plantations over the last 20 years (Koh and Wilcove 2008), so that the ratio of forest loss due to palm oil account for about 3.9 to 10.5% of total deforestation in Indonesia. Although the data clearly show that oil palm plantations have been contributed to deforestation in Indonesia to some extent, it has to taken into account that the role of oil palm plantations have been by far exaggerated since the need for land use changes to stimulate economic development comes from several sources. In fact, the data indicates that a rise in land use for non-agricultural purposes has been a much bigger contributor to the decline in forestry land than oil palm. Since 2000, other land use, such as buildings and roads, has increased by 9.4 million ha compared to oil palm plantings of about 2.9 million ha.

In Malaysia, the other major producer of palm oil, a slightly different pattern can be observed. Since 2000, Malaysian oil palm plantings have increased by about 1.1 million ha, a rise of 32 percent. The average annual growth of around 130 000 ha cannot be considered as dramatic at all for an industry experiencing strong global demand and favourable returns. However, most of the newly established oil palm plantings are not grown in place of primary rain forest but rather on land formerly used for other crops. Plantation areas for rubber and cocoa, for instance, have fallen by 260 000 ha since the year 2000.

Again, it has to be considered that land might have been initially deforested for other reasons and then finally be planted with oil palm. It is economically and ecologically efficient to use these formerly degraded and abandoned agricultural lands to grow native perennials such as Jatropha or oil palms for biofuel production as this could spare the destruction of native ecosystems. Moreover, this measure reduces GHG emissions as carbon being stored in the soil and the growing palm. (Tilman et al., 2006; Fargione et al., 2008; Field et al. 2008).

According to the German Advisory Council on Global Change, in such a situation a major climate change mitigation effect can be achieved at very low cost (WBGU 2008). In such cases, oil palm could wrongly, but easily, be identified as a driver of deforestation; as done by same NGOs (e.g. Friends of the Earth 2006).

Moreover, oil palm might be also used as a pretext by companies to obtain permits to clear land for other purposes (Fritzherbert 2008). Especially in Indonesia, corruption and ambiguities in the land tenure system combined with increased regional autonomy, have made it easier for timber, plywood and paper pulp companies to obtain permission to clear millions of hectares of tropical forest under the pretence to establish a plantation, without later planting oil palms (Holmes 2002; Laurance 2007; Sandker et al. 2007; Fritzherbert 2008; Potter 2008). The figures stated above show that unlike suggested by environmentalists groups, deforestation related to palm oil production is not that big issue. Moreover, taking the measurement constrains into account, the prime forest loss related to palm oil plantations should be even smaller.

Overall, oil palm plantings cannot be considered as the major contributor to deforestation in South-East Asia. Although a lack of independent monitoring of government statistics, changing definitions of forest and a lack of information on causes of land-cover change hamper comprehensive and reliable estimations regarding this issue (Dennis et al. 2005; Hansen 2005; Grainger 2008) is occurs as if the substitution of unproductive or other agricultural land to oil palm plantations seems to be structurally underestimated by those who blame the palm oil industry for being the primal cause of deforestation.

Another important aspect of the methodology required in the Directive is the consideration of soil emissions because of land-use change. According to the study of Eickhout et al. (2008), the default values stated by the Commission are very high. For example, the emissions are supposed to be 68 gCO2eq/MJ if permanent grass (not biodiversity rich grasslands, since this category is excluded in Article 17(3)) is converted to arable land for biofuels. This value is difficult, if not impossible, to overcome by the advantages of biofuels (Eichhout et al. 2008). Therefore, the methodology is a clear incentive to use existing arable land which is overabundantly available in Europe, but lacking in tropical countries.

Without doubt, any human activity that goes along with the use of land and natural resources is a potential threat for pristine nature. That is why one has to compare the biodiversity of oil palm plantations with other forms of land use such as agricultural land or industrial monocultures and not just to the rainforests they might replace in order to provide a comprehensive assessment of the impact of oil palm plantations on biodiversity. "If a comparison is to be made, the biodiversity of the oil palm, an agricultural crop, should be compared with that for soy bean or rapeseed, corn or sugarcane or other agricultural crops. […] Biodiversity that exists in the oil palm plantations is a bonus for all to benefit, while we enjoy the supply of oil." (Basiron 2009, pp. 1)

As a matter of fact, oil palm plantations are relatively rich in biodiversity compared to heavily logged forests or other agri-monocultures. Fitzherbert et al. (2008) shows that across all taxa, a mean of 15% of species recorded in old primary forest (and 50% of that in secondary forests) is also found in oil palm plantations. Compared with a European rapeseed plantation or a sugarcane field on Mauritius, this is a pretty good value, especially in the face of the fact that tropical rainforests are the most biodiversity rich landscapes; with around 82% of the world's biodiversity are found here (Mogato 2008). When compared with sugar cane or rapeseed farms, which support almost no wildlife (O'Brien et al. 2008), oil palm plantations are no biological deserts at all. Furthermore, countries in South-East Asia are still abundant of natural forest, compared other regions in the world. In Malaysia – a major producer of palm oil – for instance, more than 50% of the territory is reserved for forest compared to about 25% in Europe.

Contrarily to oil palm plantation, the cultivation of energy crops in Europe have involved further intensification of modern agricultural practice such as the switch from spring to winter crops, the loss of marginal hedgerows and the decline in the area under cultivation (O'Brien et all. 2008). This practice caused a dramatic decrease in many species that are dependent on traditional arable practices (Curtis et al. 1988; The Heritage Council 1999; Taylor and O'Halloran 2002). Conventional soil cultivation (i.e. mechanical ploughing, tilling, etc.) as required for annual crops like rapeseed or soy been harms the species diversity of soil organisms to a great extent, such as earthworms (Schmidt and Curry 2001; Schmidt et al. 2001; Curry et al. 2002), carabid beetles (Fadl et al. 1996; Purvis et al. 2001; Purvis and Fadl 2002), collembola (Brennan et al. 2006) and other arthropods (Purvis and Curry 1980). Of course, these organisms are not as visible as – for example – an Orang Utan, but they are ecological important and worth to be protected, too.

Indeed, with small measures, maintaining and restoring forest cover along waterways, conserving peatlands and high value conservation areas, and reducing the use of fertilizers and pesticides, the biodiversity of existing plantations can be augmented. Moreover, especially in Malaysia there are opportunities to covert degraded and abandoned agricultural lands (former banana or rice plantations) for oil palm. This will not involve the deforestation of current pristine permanent forests (Mongabay 2009).

Another aspect that is often missed in the public discussion on biodiversity is the trade-off between enhancing the biodiversity value of plantations and minimising expansion into forested areas: if biodiversity-friendly management reduces yields, then more land is needed to achieve production targets (Green et al. 2005). Given the extraordinarily high yields of oil palm, it must be stated that from a global biodiversity perspective it is superior to use oil from South-East Asia palm than from European rapeseed, as oil palm is the highest yielding conventional oilseed on the market (Doornbosch and Steenblik 2007; Eickhout et al. 2008; Thamsiriroj and Murhy (2009). The high yields of oil palms means that less land needs to be converted (with adverse biodiversity impacts) to produce the same amount of oil than the land been cultivated with other crops.

And, by the way, is it fair, to consider only continuous agricultural land use in Europe (e.g. for rapeseed), where the land transformation took place a hundred ears ago, or should this transformation rather be included in calculating default values (Mattsson et al. 2008)?

4. The Development Perspective

A decent agricultural development is the most promising if not the only reasonable strategy to alleviate the urgent problem of poverty and hunger in the developing world. According to the UN Millennium Development Goals Report, there are about 1.5 billion people living in extreme poverty on less than US$ 1.25 a day (UN 2009). World hunger is projected to reach a historic high in 2009 with more than one billion people going hungry every day. Almost all of the world's undernourished live in developing countries in tropical areas. In Asia and the Pacific, an estimated 642 million people are suffering from chronic hunger and in Sub-Saharan Africa 265 million (FAO 2009). Many of the world's poor and hungry are smallholder farmers in developing countries. Yet they have the potential not only to meet their own needs but to boost food security and catalyse broader economic growth. To unleash this potential and to remedy the problem of hunger in the world core investments in agriculture must be encouraged, supported and protected so that smallholder farmers as well as lager farms and enterprises can enhance their efficiency and succeed on domestic and international markets. A liberalization of the markets for agricultural products could significantly contribute to higher growth and employment in the world’s poorest countries.

Palm oil is a staple part of the national diet in many developing countries, already an important pillar of rural development in some tropical countries and a major generator of jobs and prosperity. Palm oil accounts for about one third of the global production of edible vegetable oils and offers further opportunities especially in areas where the industry has not been developed yet, e.g. Sub-Saharan Africa.

An encouraging example for rural development via oil palm plantings is the FELDA (Federal Land Development Authority) resettlement program in Malaysia which is internationally recognized as a success story in terms of cultivated area, number of settlers, and scope of vertical integration in the Malaysian palm oil industry during the past three decades. When the world market demand for rubber, Malaysia's dominating agricultural export commodity in the first half of the 20th century, declined in the 1960s, palm oil became the leading product in agricultural production and exports during the 1970s. Since then, the ethnic-based development strategy (NEP) further stimulated expansion of FELDA-land under oil palms and the number of settlers in the schemes. The Malaysian palm oil industry expanded downstream. As a result, production patterns and exports became increasingly diversified into a large number of palm processed products, reducing the dependency from raw palm oil. However, investments by transnational companies in labour-intensive segments of the electronics industry resulted in labour shortages in the agricultural sector during the 1980s. In addition to increasing absenteeism caused by social differentiation between settlers, this shortage was also felt in the FELDA schemes. To solve these problems, various attempts to restructure property relations and organizational structure were implemented by settlers at the local scheme level. Thus, in the 1990s settlement schemes were divided into a commercial section with schemes based on hired wage labour and a traditional settler section. This new organizational structure, containing a mix of property relations, is embedded in the WTO's new international regulation of agricultural trade, by adapting FELDA's institutional set-up to the WTO rules. As a result, the flow of palm oil from the resettlement schemes could continue without exposing the national palm oil industry to external barriers. Hence, in the mid-1980s, palm oil became the most important vegetable oil in world trade with Malaysian exports constituting about two thirds of total exports (Fold 2000).

The success story of palm oil continued in the new millennium and palm oil production doubled from 2000 to 2008, the strongest growth among all oil crops. The palm oil industry is already a major employer in South-East Asia with almost one million people directly or indirectly employed in the Malaysian palm oil sector alone and an ever increasing number of people benefiting from industry growth in Indonesia and Thailand. Employment in Indonesia's palm oil industry already exceeds one million people with a significant share of the workforce engaged in cultivation. The palm oil industry has become a major source of export earnings in South-East Asia in recent years. The industry supplies a healthy, low-cost product that is a staple of the national diet, as a cooking oil and processed food ingredient. It has also provided substantial regional employment and farm income benefits for many people living in low-income households.

The health and nutritional properties of palm oil have seen an increase in demand in other countries. Palm oil is high in mono-unsaturated fats, fats that are considered advantageous for a lower risk of heart disease. A further advantage is that it does not require hydrogenation to achieve a solid state for manufacturing margarine. This avoids the creation of the trans-fatty acids which are considered harmful to human health. These properties have contributed to an increased demand for palm oil in some developed economies. It has become a strong competitor with vegetable oils made from soybeans and rapeseed that require hydrogenation to achieve a solid state. World trade in palm oil has expanded and has more than doubled since the year 2000 (chart B). Palm oil currently accounts for about 60 percent of the world trade in vegetable oils. Indonesian exports have steadily grown and in 2008 export sales of oil palm products accounted for more than US$ 8 billion and Malaysian export earnings reached almost US$ 20 billion. In the face of growing worldwide demand for palm oil, this development is supposed to continue and the industry offers significant opportunities not just in South-East Asia where the sector is already strong but also in other tropical countries. The palm oil industry could be an engine of economic growth and development in rural areas in Sub-Saharan Africa as well as in the Pacific and Caribbean, too.

Hence, the production of biofuels offers new opportunities for development through trade, as some developing countries have a comparative advantage in producing highly efficient biofuels like palm oil at lower cost than the developed countries where demand for biofuels is growing, not least in response the EU Renewable Energy Directive.

As shown in the previous chapters of this paper palm oil is by far the most competitive vegetable oil for the production of biodiesel (Thones 2006). The increase in trade in palm oil can provide a new source of revenue for farmers in the tropical world (Legge 2008). Koonin (2006) estimates that biofuels could supply 20-30 per cent of global fuel demand in an environmentally responsible manner without seriously affecting food production. An analysis by Banse and Grethe (2008) shows that the additional demand for biofuels to meet the 10% share in total transportation fuels by 2020 can only be achieved by a strong increase in imports. Consequently, the most significant increases in biodiesel trade could be exports from South-East Asia to the EU, since the EU aims at reaching a 10% blend of biofuels in transport fuel by 2020 (Peskett et al. 2007). Moreover, oil palm could be an important complement for the sustainable development of other developing countries in tropical areas (Pinto et al. 2005). To endorse this perspective for development, the OECD countries need to reduce agricultural support regimes for domestic biofuels to avoid penalising developing countries that already have restricted access to OECD markets (Peskett et al. 2007). Restricting palm oil production worldwide and limiting access to European markets would limit an important opportunity for developing countries to raise living standards and reduce poverty. Restricting palm oil imports from developing countries restricts their capacity to grow and reduce poverty.

While economies of scale are important in biofuel processing they are less relevant in the actual cultivation and a further increase in employment can be expected by increasing output, as biofuel production is still labour intensive (Peskett et al. 2007).[13] Moreover, besides the creation of employment the main social advantage resides in the reduction of infrastructural costs for the expansion of large cities in South East Asia, as private transport can be run with a locally produced, cheap fuel (Almeida et al. 2002). Another indirect effect is that increasing palm oil production may push the political leaders in these countries to establish good governance, protect property rights, grant and secure more civil rights or open the country for international trade. These assumed effects are particularly relevant for developing countries, which often “problematic” governance quality levels, ineffective bureaucracies and difficulties to enter international trade.

[13] This is, in contrast, not so much the case for rapeseed production. According to the German government (BMU and BMELV 2009), positive employment effect can not be detected in the rapeseed industry.

The most prominent concern regarding a further growth of the palm oil industry, raised by environmentalists and the campaigns mentioned above is that the palm oil plantings – and one could say economic growth and development in general – destroy the environment and reduce biodiversity in developing countries. However, the existence of decent institutions and good governance can moderate this effect. In particular, property rights contribute much to a sustainable development and mitigate the problem of ecological destruction (Freytag et al. 2009). A precondition for a sustainable use of biodiversity is the allocation of property rights to landowners. As shown in a study of the tourism industry by Freytag and Vietze (2009), it is necessary that the property rights on biodiversity will be allocated to (public or private) landowners completely, so that they are facing a long-term perspective. Hence, there self interests will lead them to use “their” biodiversity not in a hit-and-run manner (e.g. deforestation for pasture), but sustainable to gain yields from biodiversity for a long time instead. Consequently, the WWF (among other organisations) claims that palm biodiesel production, properly managed, could increase investments in agriculture in degraded areas in developing countries, create decent employment, and have positive spillover effects on other agriculture and forestry sectors (Denruyter 2008). Hence, Jacques Diouf, Director-General of FAO, said that by bringing an agricultural renaissance and supplying modern energy to a third of the world’s population, biodiesel provides a chance to enhance growth in many of the world’s poorest countries. This means, besides helping them to use biomass to produce their own electricity, particularly improving export opportunities for developing countries to the industrialised world, as this “would allow developing countries - which generally have ecosystems and climates more suited to biomass production than industrialised nations and often have ample reserves of land and labour - to use their comparative advantage" (Financial Times 2007, pp.1).

Table 6: Produced Biodiesel by crude oil source

Biodiesel produced from (worldwide)	
- palm oil	1 %
- rapeseed oil	84 %
- sunflower oil	13 %
- soybean and other oil	2 %

Source: Thoenes 2006

Despite the huge potentials of palm oil as a feedstock of modern biofuels, the share of biodiesel produced from palm oil is currently rather negligible (see Table 6) and trade figures are still very low (Schnepf 2006).

One reason for that is that domestic production of biodiesel is supported through both border protection and production subsidies in the North. According to Thoenes (2006) there is general consensus that - in the absence of subsidies - for the production of biodiesel palm oil is by far the most competitive vegetable oil. Similar to the small share of produced palm oil, the reason for the dominant role of rapeseed oil – a relatively high priced feedstock – is to find in the high level of subsidies and public support provided in EU countries where domestic rapeseed oil represents the main feedstock for biofuel production. Again, in the absence of public support, rapeseed based biodiesel is not competitive, even on a long term basis (Thones 2006). The US whose production subsidies are over $US 7 billion, and the EU are subsidizing domestic plant oil producers to a great extent (see Table 7).

Table 7: Subsidies to ethanol and biodiesel per litre net fossil fuel displaced

Support per litre equivalent of fossil fuels		**Ethanol**		**Biodiesel**	
Country / Region	**Units**	**Low**	**High**	**Low**	**High**
United States	$/litre equiv	1.03	1.40	0.66	0.90
European Union	$/litre equiv	1.64	4.98	0.77	1.53
Switzerland	$/litre equiv	0.66	1.33	0.71	1.54
Australia	$/litre equiv	0.69	1.77	0.38	0.76

Source: Doornbosch and Steenblik (2007).

Moreover, the EU's tariff structure is protecting the processing industry; raw materials can be imported at very low tariffs or even duty free while a higher value-added tariff is levied on processed vegetable oil products than on crude vegetable oils. EU tariffs and subsidies that support domestic oil seed producers became one of the main conflicts between the EU at one side and the United States and the South-East Asian palm oil producers on the other side. This conflict which started during the GATT negotiation on agriculture in the late 1980s and early 1990s is still hampering the WTO negotiations in the current Doha round.

From a global economic – and not least ecological – perspective the structure of the world market for biofuels can referred to as inefficient. Biofuels produced in tropical regions from sugarcane and especially palm oil have considerable environmental and cost advantages over those derived from agricultural crops in temperate zones. Therefore, trade between the efficient producers and OECD countries is mutually beneficial. Moreover, as import tariffs and production subsidies are protecting domestic consumers which keep prices artificially high, such measures are welfare impairing.

Another argument aims at a more universal perspective on economic development. From a developmental perspective, it can be argued the palm oil producing countries like Indonesia, Thailand or Malaysia, as any other developing countries have the same rights to develop their economies as industrialized nations have had. In Sarawak (part of Borneo) for example only 8% of the land is developed for agriculture compared to the UK which has over 70% of its land under agriculturally use (Mogabay 2009). Put it another way: European countries have come a long way and used the natural resources in an intense and often destructive manner in order to grow and develop a highly sophisticated and efficient industrial structure. This process which took a couple of hundred years, indeed, came along with a substantial loss in biodiversity and the conversion of land. According to a recent study by the German Bundesamt für Naturschutz (BfN) which includes 478 native species of mammals, breeding birds, reptiles, amphibians, freshwater fish and lampreys, currently there are 207 species of them (43 percent) on the "Red List" meaning that they are classified as endangered. 28 percent of all vertebrates are highly endangered. Together with the 32 species that have already disappeared, Germany is threatened to lose one third of its terrestrial vertebrate fauna.

Compared to these figures biodiversity in tropical areas can be referred to as considerably high, by all means. Without doubt, these precious assets should be preserved and initiatives in order to protect the environment in developing countries could help to enhance the sustainability of land use in these countries. However, one has to consider the right of developing nations to foster economic growth and development and that this will be associated with changes in land use. Any strict "no conversion" policies would seriously impede effective strategies to alleviate poverty, would jeopardize further economic development and – not least – would be simply unfair.

5. Conclusion

Although the initial concern of European initiatives towards renewable energies was to support these energies in order to address the challenge of climate change, the actual policies turn out to be discriminatory and therefore problematic, both from an economic and ecological point of view. Environmental standards have been designed and/or interpreted in favour of certain oil crops grown in the EU and as protectionist measures that are distorting or even exclusionary for smallholders in developing countries which must resort to the default values. This has fatal consequences for economic development and the convergence processes worldwide (Legge 2008). From an environmental perspective, only equal global certification is fair and effective. Selective certification gives the requirement of sustainable production to some (Indonesia, Malaysia, Thailand) while allowing the practice of unsustainable production to continue for others (e.g. in Europe) (Doornbosch and Steenblik 2007). Therefore, any sustainability criteria must apply equally to European and to overseas producers wishing to export biofuels to the EU market (Cockerill and Martin 2008). Only a fair and objective approach in assessing the efficiency and sustainability of biofuels could avoid standards being protectionist or skewed to the interests of Northern countries (Legge 2008). Nevertheless, the former European Commissioner for Trade, Mr. Peter Mandelson, stated that Europe should accept that it will need to import a large part of its biofuel supplies. In his opinion Europe should not favour EU biofuels with a weak carbon performance if it can import cleaner, and cheaper, biofuels (Doornbosch and Steenblik 2007). This gives the hope that the EU will rethink the Directive to enhance economic welfare and quality of the environment.

It is, by all means, necessary to effectively deal with environmental problems all over the world in order to protect the environment and safeguard biodiversity. However, the strong demand – economically speaking – for a clean and healthy environment (as well as for high labour and social standards) in Europe is an expression of the high level of development these countries have already reached. In other words, European citizens who – more or less – live in a post-materialistic world, have a strong demand for such goods simply because they can afford it. A poor farmer in South-East Asia or Sub-Saharan Africa whose primary concern is to feed his family and get his children educated might set other priorities and it is – from our point of view – understandable that he might value these urgent needs higher than the habitat requirements of some monkeys. Therefore, in order to protect such habitats and the environment in developing countries in general, governments in rich countries should rather offer opportunities for poor people to earn their livelihood and support environmental initiatives that are consensual with a sustainable economic development.

Our analysis clearly shows that palm oil is much more efficient than other oil crops and offers significant advantages such as higher yields per hectare, very low fertilizer input and according GHG emissions, an efficient use of residuals to produce energy for the production process and beyond, tremendous development perspectives in rural areas in the tropical world. Deforestation associated with oil palm plantings is much less significant than postulated by some campaigns and perceived by the public. Effective initiatives to preserve natural forest are already in place in South-East Asia. Furthermore, biodiversity in oil palm plantations is much higher than in most monocultures in the EU.

Therefore, the EU should reshape its policies towards palm oil, conduct objective and non-discriminatory calculations regarding the GHG emissions saving values and support palm oil imports from developing countries rather than restricting them. Together with certain initiatives to further enhance energy efficiency and to protect precious habitats combined with strategies to strengthen property rights and encourage efficient land use and successful strategies of agricultural development, this would not only prevent political conflicts and trade disputes in conjunction with the issue of palm oil but also foster economic growth and development, reduce poverty and – not least – contribute to the ambitious GHG emissions savings goals on a fair and reasonable basis.

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