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Supply-side Policies to Conserve Biodiversity and Save the Orangutan from Oil Palm Expansion: An Economic Assessment

by

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by

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Supply-side Policies to Conserve Biodiversity and Save the Orangutan from Oil Palm Expansion: An Economic Assessment

ABSTRACT

Tropical forests are biodiversity-rich but are dwindling at a rapid rate, not only in Southeast Asia but elsewhere also. The result is a loss of natural ecosystems, a reduction in carbon sequestration, and increasing global extinction of wild species, including iconic species. While several developments contribute to the destruction of tropical forests, the main threat comes from their clearing for the purpose of agricultural production, for example in the Amazon Basin for the expansion of the beef industry and soya bean cultivation. In Borneo and Sumatra, the principal threat to tropical forests comes from the expansion of oil palm (*Elaeis guineensis)* cultivation. This is expected to result in significant biodiversity loss and is a danger to the continuing existence of the iconic orangutan (*Pongo pygmaeus*). The preferred route for oil palm expansion is by the conversion of lowland tropical forests to plantations. Lowland tropical forests are the prime habitat of the orangutan and this species is especially at risk as a result of oil palm expansion. Two supply-side policies have been suggested in the literature as ways to reduce this expansion and reduce pressure on species such as the orangutan. It has been recommended that *Imperata cylindrica* grasslands be used to help accommodate future oil palm expansion in Borneo and Sumatra and that emphasis be placed on raising the yield of oil palms. It is hypothesised that this will reduce the demand for clearing tropical forest for the purpose of oil palm expansion. Both of these hypotheses are critically evaluated by means of economic analysis. It is concluded that neither of these policies are likely to be very effective in reducing the clearing of tropical forests in Borneo and Sumatra in order to grow oil palm.

Supply-side Policies to Conserve Biodiversity and Save the Orangutan from Oil Palm Expansion: An Economic Assessment

1. Introduction

The tropical forests are home to up to two thirds of all the species in the world yet these forests continue to be destroyed at a rapid rate (Pimm and Raven, 2000). The result is substantial loss of natural ecosystems and carbon storage and increased extinction of wild species, including some of the most unique plants and animals. While several developments contribute to the destruction of tropical forests, the main threat globally comes from their clearing for the purpose of agricultural production (compare Harting, 1880; Swanson, 1994; Geist and Lambin, 2002). In the Amazon Basin, for example, tropical forests are being cleared to make way for the expansion of the beef industry and for soya bean cultivation.

In Southeast Asia, where deforestation rates have been high (Achard et al., 2002), the expansion of oil palm (*Elaeis guineensis)* planting in Borneo and Sumatra is a major source of loss of the biodiversity contained in the tropical forests of these areas. The forests of this region are known for their outstanding species richness and endemism (Whitten et al., 2004). Oil palm expansion is also a threat to the continuing existence of orangutan (*Pongo pygmaeus*) populations (Nelleman et al., 2007). The orangutan only exists in the forests of Borneo and Sumatra and is vulnerable to extinction as a result of the destruction of tropical forests (see, e.g., Tisdell and Swarna Nantha, 2007). Already a large portion of these forests has been cleared to make way for oil palm plantations and expected further expansion in plantings will make substantial inroads into remaining stands of tropical forest. The private economic returns from oil palm cultivation are high and the highest economic returns can be obtained from the cultivation of these palms in areas containing lowland tropical forest because of the suitable agro-climate. These are the areas of greatest biological diversity and the preferred habitat of the orangutan, which requires the conservation of substantial tracts of tropical forest in order to survive.

In the literature, it has been suggested that the problem of forest-clearing for the expansion of oil palm production might be eased or solved by a combination of supply-side policies designed to reduce the need for tropical forests to be cleared to expand oil palm production (Koh, 2007; Koh and Wilcove, 2008). The two main policies proposed are (1) to limit plantings of oil palm to non-forested areas, particularly grasslands, and (2) to increase oil palm yields so that a larger volume of oil is obtained from existing plantations. It is argued here that these policies are unlikely to be very effective in reducing demands to clear forested areas for oil palm expansion.

In this paper, we first of all provide some information about the demand for expanding the planting of oil palm in Indonesia and Malaysia and present projections of the likely expansion in the area planted and the extent of its expected encroachment on tropical forests. Its expected consequences for loss of biodiversity are noted. Then the suggestion that grasslands be used for future oil palm expansion is assessed. Next the contention that increased oil palm yields will reduce pressure on the clearing of tropical forest is considered before concluding.

2. Projected Expansion of the Area Planted to Oil Palm in Indonesia and Malaysia and its Implications for the Conservation of Biodiversity and particularly the Orangutan

Almost 10% of the world's permanent cropland is planted with oil palm (Koh and Wilcove, 2008). Though more than 40 countries grow oil palm, 87% of palm oil output comes from Malaysia and Indonesia. The oil palm flourishes in the relatively constant tropical temperature and precipitation of these countries.

Since 1990, the area cultivated with oil palm in Indonesia and Malaysia more than trebled (24,200 km^2 to 82,100 km^2 in 2006) (see Carter et al., 2007; FAO, 2008) (Figure 1). The average increase in cultivated area during this period would thus be about 3,650 km^2 annually. Projections for the period 2005 and 2012 however indicate a rise in the annual increase in planted area, to about 6,221 km^2 per year based on Carter et al. (2007). Total oil-palm cultivated land in Indonesia and Malaysia is expected to come close to 12,000 km^2 by 2012, with most of the increase in planted area likely to occur in Indonesia where suitable land is still plentiful. Expansion in Malaysia is likely to plateau in the long-term due to shortage of land.

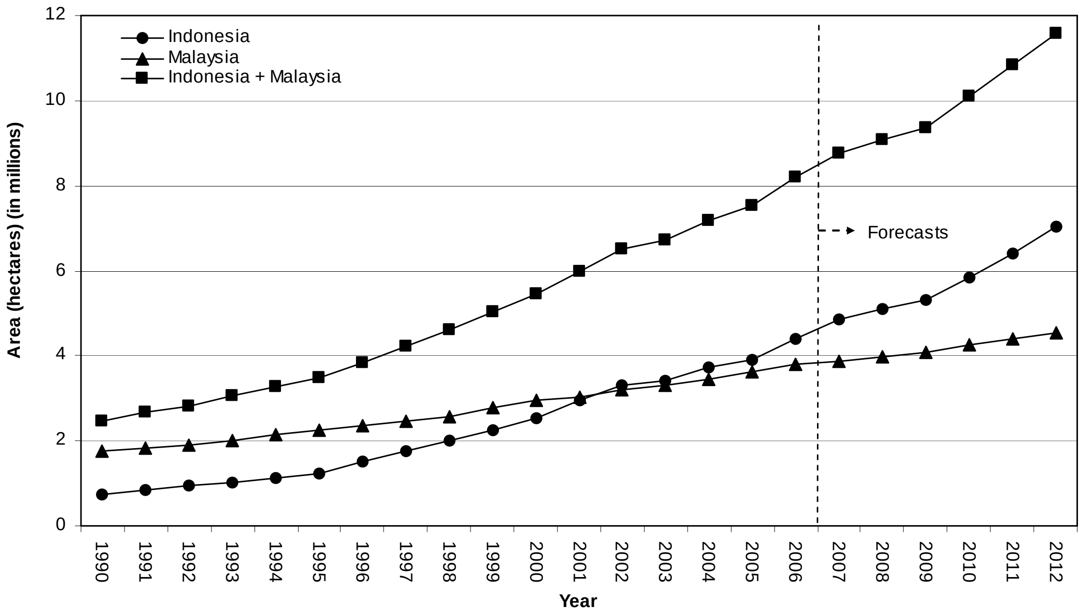

Figure 1: The areas cultivated to grow oil palm in Indonesia and Malaysia between 1990 and 2006 (based on Carter et al., 2007; FAO, 2008) and projections up till 2012 (based on Carter et al., 2007). 1 km^2 equals 100 hectares.

What amount of tropical forest loss does this expansion imply? According to Koh and Wilcove (2008), between 55-59%, and at least 56% of land converted for oil palm in Malaysia and Indonesia respectively, between 1990 and 2005, was forested land. The remainder consisted mostly of agricultural land planted to other crops such as cocoa and rubber that were converted for oil palm. Thus, between 1990 and 2005, when 50,640 km^2 of land were added to the total oil palm cropland in Indonesia and Malaysia, at least 55% or 27,852 km^2 of this amount would have been cleared forests (implying an annual loss of at least 1,857 km^2 of forests as a result of oil palm expansion during that period).

If the projected annual increase in oil palm cultivated area of 6,221 km^2 occurs, and occurs entirely on the island of Borneo (a major oil palm expansion frontier and home to the largest number of orangutans), then the implications for forest loss there and the loss of orangutan habitat would be significant. Given that orangutan habitat constitutes 35% of the total forest cover in Borneo (the remaining orangutan habitat in Borneo as of 2005 being 127,797 km^2 (Meijaard and Wich, 2007) and total Bornean forest cover in the same year being 366,365 km^2 (Rautner et al., 2005, p. 73)), and taking Koh and Wilcove's (2008) lower bound value of 55%, then at least 1,198 km^2 of Bornean orangutan habitat could be lost each year due to oil palm expansion, assuming that orangutan habitat is evenly spread out. If an estimated orangutan density of 1 orangutan per km^2 is assumed, then at least a thousand orangutans may perish each per year. Note that the total remaining number of orangutans in Borneo is probably between 40,000 and 50,000 and currently still on the decline (Meijaard and Wich, 2007). Other studies indicate sharp decreases in bird and butterfly species when primary and logged forests are converted to oil palm plantations (see Koh and Wilcove, 2008). Large mammals such the orangutan would be unable to persist in such an agricultural landscape, and are not usually tolerated by oil palm farmers who consider them as pests.

Because of the significant impact that agricultural conversion has on the highly species-rich forests of this Southeast Asian region, conservation biologists have suggested that forested lands be avoided as far as it is possible when agricultural development is considered.

3. The Proposal to Use Grassland rather than Forested Land for Oil Palm Expansion

It has been suggested that pressure for clearing tropical forests for oil palm expansion would be moderated if non-forested lands, particularly *Imperata cylindrica* grasslands were used for the planting of oil palm (e.g., Reinhardt et al. 2007; Koh and Wilcove, 2008). However, the availability of these lands is relatively limited. Garrity et al. (1997) estimated that 86,000 km^2 of grasslands existed in Indonesia, with a quarter of this total amount each to be found in Kalimantan, Borneo and Sumatra. Even if all oil palm expansion were restricted to these lands, they would only cater for oil palm expansion temporarily. Given the projected annual increase in oil palm cultivated area for Indonesia of 4,803 km^2 (based on Carter et al., 2007), the extent of grasslands estimated by Garrity et al. (1997) for Kalimantan would be able to accommodate only 4½ years of this expansion. This is assuming that these grasslands are large and contiguous, when much of these are rather scattered. Therefore, the respite would be a brief one, if at all these grasslands can be fully or economically used (they may not appeal to large-scale planters if no large contiguous grasslands are available).

Secondly, the fact that these lands are not being used currently for oil palm production indicates that it is relatively uneconomic to establish oil palm plantations on them (especially for smallholders who lack large capital). Presumably, their use for oil palm production would need to be subsidised. Although *Imperata* grasslands can be planted with oil palm, they have some soil fertility constraints. These lands will need rehabilitation by use of fertiliser and weeding of *Imperata* grass, which can be labour-intensive if herbicides are not used (Santoso et al., 1997). *Imperata* grass can burn quite easily. If *Imperata* grass reestablishes after crop planting, it could pose a fire risk and can also harm the proper growth of crops including the oil palm (Chikoye, 2003). Oil palm planters also prefer forested land because the timber revenue obtained by clear-felling the forest helps finance crop planting (Clay, 2004). Thus to induce the use of these grasslands, governments need to be committed to designing and implementing policies that create incentives for the use of grasslands (by subsidising rehabilitation or taxing 'green' palm oil lower) and disincentives to exploiting forest lands (by applying higher taxes for using forest lands and penalising those who clear-cut and leave), especially when grasslands or other degraded lands are available. International environmental policies, such as those related to reducing greenhouse gas emissions, if effectively designed and executed with non-forested lands in mind, could shift the pressure of exploitation from forests to degraded lands.

Consider some economic analysis that may be applicable to this case. As mentioned, the fact that grassland is not currently being converted to palm oil production indicates that it is less profitable than using other types of land, such as forested land, for palm oil production. As pointed out above, this situation can only be altered by subsidising the growing of oil palm on grassland or by taxing the growing of oil palm on forested land or by the government restricting access to forested land for the purpose of growing oil palm. There may be a case for taxing the clearing of forests because of the negative environmental externalities generated and governments in the region may be too willing to make state-owned land available for palm oil development. Concessions may be given for use of this land on terms that do not fully reflect its market value, let alone its conservation value. The under pricing of forested land made available for oil palm expansion means that the use of forested land for oil palm obtains an indirect subsidy.

It can also be argued using economic analysis that the supply of oil palm from grasslands is unlikely to result in a significant reduction in the price of palm oil. Consequently, the profitability of clearing forest for oil palm expansion remains unchanged or is only slightly reduced. Furthermore, there will be a lag in oil supplies coming onto the market from grasslands because oil palm takes a while to mature.

Figure 2 illustrates the point that increased supply of palm oil from grasslands is likely to have little impact on the price of palm oil. This is because the demand for this oil is relatively elastic (its demand curve is relatively flat because there are several other vegetable oil substitutes for palm oil) and the increase in the supply of palm oil from grasslands would be relatively small. In Figure 2, it is assumed that the line S_1S_1 represents the supply of palm oil if grassland is **not** used for its production. The difference between line S_1S_1 and S_2S_2 represent the potential supply of palm oil from grassland. The demand curve for palm oil is indicated by line DD. If the market happened to be in equilibrium in the initial situation, market equilibrium would be established at E_1 with X_1 of palm oil being supplied. This would sell at P_1 per unit. Should supplies of oil become available from the grassland, the market equilibrium will alter from E_1 to E_2. There is a slight reduction in the palm oil price from P_1 to P_0. Grasslands account for $X_1 - X_2$ of the supply of oil and the supply of oil from other than grasslands falls from X_1 to X_0 once the market has fully adjusted to the extra supplies of oil palm from the use of grasslands. There might, therefore, be a **slight** reduction in the amount of forested land cleared for palm oil production.

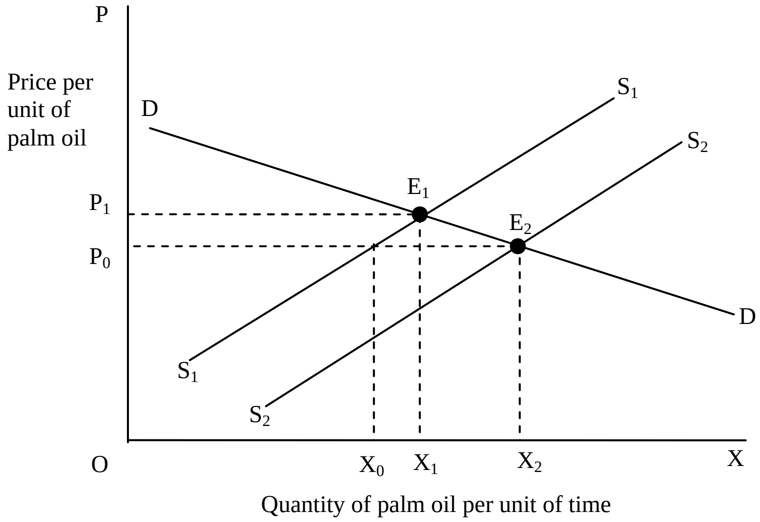

Figure 2: An illustration that if the demand curve for palm oil is relatively elastic, an increase in its supply by using grassland does little to reduce its supply from other sources. In this case, an increase in the supply of palm oil resulting from a shift in the supply curve to the right results in a small reduction in the equilibrium price of palm oil and hence, does little to reduce its supply from the use of forested areas.

If the demand curve for palm oil is perfectly elastic (a horizontal line) the use of grasslands to supply palm oil will not reduce the price of palm oil at all. It will therefore, not reduce economic pressure to clear forested land in order to grow oil palms. In general, the more elastic the demand for palm oil, the less is the extent to which increasing supply of oil from other than forested land mitigates the demand to clear forested land to grow oil palm. Furthermore, the reduction in palm oil supply from other than grassland will always be less than the increase in supply from the use of grassland unless the demand curve for palm oil is perfectly inelastic in which case the reduction in oil supply from other than grassland will exactly equal the extra supply resulting from the use of grassland. For example, in the illustration given in Figure 2, the use of grassland results in an extra supply of palm oil of $X_2 - X_1$ but the reduction in supply from other areas is only $X_1 - X_0$. Thus, this supply-side strategy for reducing the use of forested land for oil palm production is much less effective than it may appear to be at first sight.

Of course, the model illustrated in Figure 2 is based on comparative statics. At present, the oil palm market appears to be in disequilibrium and in the long-term, the demand for palm oil seems to be trending upwards. In such a changing economic situation, use of grassland may fail to halt the upward trend in the conversion of forests to grow oil palm. At most, it may slow the conversion process.

This is illustrated in Figure 3 using comparative static economic analysis. There D_1D_1 represents the original demand curve for palm oil and the line marked D_2D_2 indicates the subsequent demand for palm oil as a function of its price. As before, S_1S_1 represents the supply relationship for palm oil in the absence of grasslands being used for that purpose. The difference between line S_1S_1 and S_2S_2 represents the supply curve for palm oil if grasslands are used to supply extra quantities of palm oil. As previously explained, in the absence of any other changes, market equilibrium will alter from E_1 to E_2 and the price of palm oil would fall. However, if the market demand for palm oil is trending strongly upwards (as appears to be the case in the long-term) the equilibrium market price of palm oil can be expected to rise. For example, suppose that as grasslands are brought into production to supply palm oil, the demand relationship for palm oil shifts up from the line marked by D_1D_1 to that marked by D_2D_2. Then the market equilibrium changes from E_1 to E_3 and the price of palm oil increases from P_1 to P_2 despite the increased supply of palm oil from the use of grasslands. This increase in the price of palm oil means that there is an economic incentive to further expand the area of land planted with oil palm. Therefore, although the use of grasslands in this case may slightly reduce the extension of oil palm plantations into forested land, the extension continues with only slight abatement.

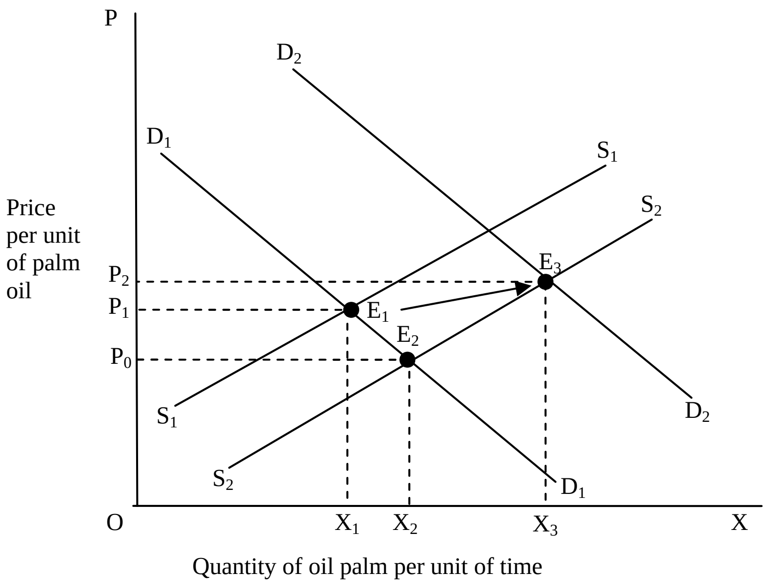

Figure 3: An illustration that a strongly rising demand curve for palm oil may more than offset any reduced economic incentive to clear tropical forest in order to plant oil palm such as might result from extra supplies of oil palm obtained by using grasslands for palm cultivation.

4. The View that by Increasing Palm Oil Yields that this will Reduce Economic Pressure to Clear Forests in order to Grow Oil Palms

Corley and Tinker (2003, p. 18) and Koh (2007) have argued that if oil palm yields can be increased, this could reduce economic pressure to convert additional land, such as forested land, to palm oil production. It is frequently highlighted that there is huge scope for increasing the yield of oil palm, given that the theoretical yield is 18.6 tonnes per hectare (Corley, 1996) while average yields in Malaysia and Indonesia have usually been slightly below four tonnes per hectare. However, it should be recognised that this strategy will not necessarily have the results predicted and could, in fact, increase pressure on forested lands as explained below.

The consequences of higher palm oil yields will depend on the impact of the extra supply of palm oil on its price and on the areas where the increased yields occur. If the increased yields are confined to areas already used for oil palm production or non-forested land, the similar arguments to those given in relation to Figure 2 apply. The increased yields may not reduce the price of palm oil much if the demand for palm oil is elastic. Therefore, the demand to clear forests for oil palm production would fall only marginally. If the increased yields are also available to those who clear forested land especially smallholders (e.g., if high-yielding planting material is not too costly or if fertiliser costs are subsidised), it is even possible that this strategy will accelerate the clearing of forested land to grow oil palm. As a result, forest destruction could accelerate, biodiversity may be lost at a faster rate than otherwise and the extinction of the orangutan could become more probable. This would be a perverse result of this proposed strategy. On the other hand, higher yields from oil palm or non-forested land might make it easier for governments to deny developers access to forested lands to grow oil palms. At the same time, if the higher yields are available from palm oil grown in forested areas, political pressure on governments by growers of oil palm to release such land is likely to increase.

There are however, benefits to intensification that should not be overlooked by plantation-scale oil palm cultivators. Reducing the area of land under cultivation by increasing yield can reduce management and labour costs. The abandoning of planted area during periods of low prices results in losses. Intensification allows for adjustment to price changes without the additional cost of opening up new lands. On the whole, these cost savings need to be realised by planters as this can favour intensification and reduce extensification. Smallholders who are unable to afford better planting material may be provided these at lower prices to discourage them from expanding cultivated area, especially during price booms. At the same time, it is necessary for the government to put into place policies for restricting crop expansion in tandem with supports for increasing intensification. However, as mentioned above, it may be very difficult politically for governments to adopt such restrictive policies.

5. Conclusion

It has been shown that the expansion of oil palm plantations in Borneo and Sumatra pose a major threat to the conservation of biological diversity in their tropical forest areas and are adding considerably to the likelihood of extinction of the orangutan. This article illustrates the importance of taking into account economic factors when proposing policies for the conservation of wild species. It is argued that the supply-side strategies of increasing palm oil supplies by using grasslands to grow palm oil are unlikely to be effective in significantly mitigating forest clearing. Furthermore, strategies to increase palm oil yields may also be ineffective in reducing the demand to convert forests to oil palm plantations. In fact, as is pointed out, they may increase the demand for forest conversion, depending on the circumstances. If commodity booms occur where demand far exceeds supply, then increases in supply by agricultural intensification may not dampen prices enough to mitigate crop expansion in the short term. Oil palm expansion will likely continue in the near future given strong global demand for oil palm and historically high prices. To effectively conserve forests that are valuable orangutan habitat, other measures in addition to the supply-side measures discussed in this paper will be needed. These include increasing the realisable value of orangutan habitat so that it yields financial returns that are comparable to oil palm agriculture on a per-hectare basis. Developing carbon markets that creates a demand for forest retention is one option.

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