Is Oil Palm the Next Emerging Threat to the Amazon?

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Conservation Letter

Is oil palm the next emerging threat to the Amazon?

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Abstract
The Amazon Basin appears poised to experience rapid expansion of oil palm agriculture. Nearly half of Amazonia is suitable for oil palm cultivation, and Malaysian corporations are now moving into the region to establish new plantations while the Brazilian government is considering a law that would count oil palm as "forest" towards a landowner's forest reserve requirement. Strong economic incentives for a major Amazonian oil palm industry are likely, given growing global demands for edible oils, oil-based products, and biofuel feedstocks. We have two main concerns. First, oil palm plantations are ecologically depauperate, supporting little forest-dependent wildlife. Second, we disbelieve political and corporate statements suggesting that oil palm plantations will be concentrated on previously deforested lands in Amazonia. In reality, oil palm producers strongly favor clearing primary forest for plantations because they can reap immediate profits from timber production. These profits subsidize the costs of plantation establishment and maintenance for the initial 3-5 years until the oil palm plantations become profitable. Hence, oil palm agriculture could soon emerge as a major new threat to the Amazonian environment.

Keywords: Amazon; biodiesel; biofuel; Brazil; deforestation; logging; Malaysia; oil palm plantations

Resumo
A Bacia Amazônica parece sofrer a experiencia da rápida expansão da agricultura de palmeiras de óleo. Quase metade da Amazonia é apropriada para o cultivo de palmeira de óleo, e corporações da Malásia estão agora se mudando para a região para estabelecer novas plantações enquanto o governo Brasileiro está considerando uma lei que contaria as plantações de palmeira de óleo como "florestas" em relação á exigencia de reserva florestal nas terras do proprietário. São prováveis fortes incentivos econômicos para uma grande industria de palmeira de óleo Amazonensse, dadas as crescentes demandas globais por óleos comestíveis, produtos baseados em óleo e combustiveis. Temos duas grandes preocupações. Primeira, as plantações de palmeira de óleo são ecologicamente pobres, suportanto pouquissima vida selvagem que depende da floresta. Segunda, nós desacreditamos em afirmações políticas e corporativas que sugerem que as plantações de palmeiras de óleo estarão concentradas em terras previamente desflorestadas da Amazônia. Na realidade, produtores de palmeiras de óleo sao fortemente a favor de desmatar florestas primárias para plantações porque assim eles podem obter lucros imediatos da produção de madeira. Esses lucros são vitais para compensar os gastos com custos do estabelecimento da plantação e manutenção dos 3-5 anos iniciais até que as plantações se tornem rentáveis. Portanto, a agricultura de palmeiras de óleo poderiam em breve emergir como uma nova grande ameaça para o meio ambiente da Amazônia.

Palavras-chave: Amazônia; biodiesel, biocombustível; Brasil; desmatamento, exploracão madeireira;

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Introduction

Oil palm is one of the world's most rapidly expanding crops [1]. Despite the recent economic slowdown, burgeoning demand for palm oil remains an important driver of deforestation in Southeast Asia [2], especially in Indonesia and Malaysia where over half of all the oil palm expansion from 1990 to 2005 occurred at the expense of native forest [3].

Yet few realize that oil palm could soon drive similar forest loss in Amazonia, the world's largest expanse of tropical forest. Here we briefly describe the confluence of factors that could promote a sharp increase in oil palm agriculture in the region. Although the crop is being established in various parts of Latin America, we focus here on Brazil, where geographical, political, and corporate forces appear particularly aligned to pursue the aggressive expansion of an oil palm industry. We argue that, contrary to prevailing public discourse in Brazil, oil palm expansion would constitute a serious threat to Amazonian ecosystems and their associated biodiversity.

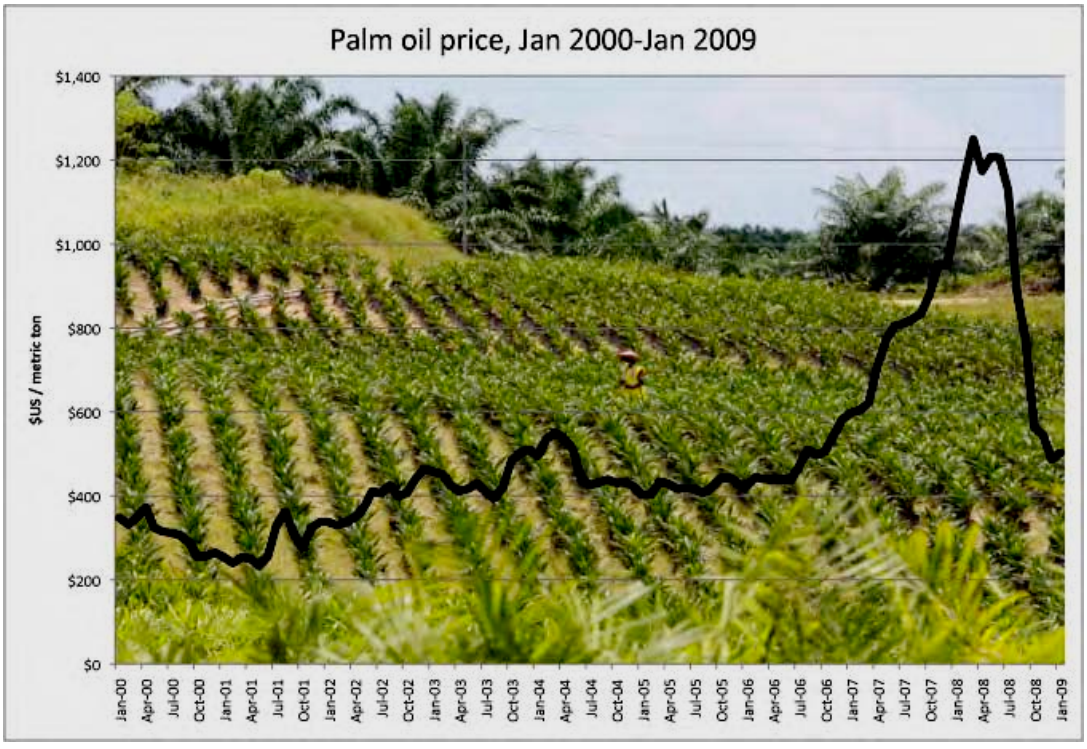

Fig. 1. Palm oil prices from January 2000 to January 2009 (from [47]). Background image by R.A. Butler.

The potential for oil palm expansion in Amazonia

A constellation of factors is contributing to a potentially dramatic growth of oil palm agriculture (Fig. 1) in Brazilian Amazonia, which contains about 40% of the world's remaining tropical rainforest. First, the biophysical potential for Amazonian oil palm production appears to be enormous. Preliminary analyses of temperature, rainfall, and soil variables suggest that almost half of Brazilian Amazonia—nearly 2.3 million km^2—is suitable for oil palm cultivation, an area far greater than that available for mechanized soy or sugarcane [4]. Oil palm prefers low-elevation regions in the humid tropics [5] and is tolerant of even quite highly acidic soils (pH of 4.0), like those that are widespread in Amazonia [7; 8]. New cultivars are also being developed with increased resistance to blight (such as "yellowing disease") and other pathogens. Oil palm is already being established on a large scale in Colombia and Ecuador [5; 9], and viable plantations, including the 40,000-hectare Agropalma estate (http://www.agropalma.com.br), already exist in Brazil. If Brazil were to fully exploit the Amazon for oil palm, it would become by far the world's largest palm oil producer [4] (Table 1).

Table 1. Palm oil production and forest land suitable for oil palm cultivation in 2008

	Palm oil production, 2008 (metric tons)	
1	Indonesia	19,700,000
2	Malaysia	17,400,000
3	Thailand	1,400,000
4	Colombia	830,000
5	Nigeria	820,000
6	Papua New Guinea	425,000
7	Ecuador	340,000
8	Cote d'Ivoire	320,000
9	Costa Rica	285,000
10	Congo, Democratic Rep	175,000
11	Cameroon	165,000
12	Honduras	165,000
13	Guatemala	155,000
14	Ghana	120,000
15	Brazil	110,000

	Forest area suitable for oil palm, 2008 (sq km)	
1	Brazil	2,283,000
2	Congo, Democratic Rep	778,000
3	Indonesia	617,000
4	Peru	458,000
5	Colombia	417,000
6	Venezuela	150,000
7	Malaysia	146,000
8	Papua New Guinea	144,000
9	Suriname	101,000
10	Bolivia	90,000
11	Cameroon	83,000
12	Gabon	81,000
13	Guyana	81,000
14	French Guiana	70,000
15	Congo, Republic of	66,000

Palm oil production data from the Foreign Agricultural Service of the U.S. Department of Agriculture [48]; crop suitability from Stickler et al (2008) [4]

Second, economic incentives for oil palm production are growing, given (1) its large yields per unit area [5], (2) the high value of palm oil compared with other agricultural products (Fig. 2) [10; 11], and [3] rising demands for its use in biofuels, food, and industrial products [12]. Expansion of oil palm plantations into remote areas would be facilitated by a proliferation of Amazonian highways and other infrastructure that is greatly increasing access to new forest frontiers [13; 14]. Oil palm would still face limitations because of its need to reach processing facilities within a day of harvest, but this could be overcome through the establishment of local oil extraction plants. However, such mills must be licensed by environmental agencies, which might be dissuaded from granting refinery licenses in environmentally sensitive areas if public opposition to palm oil expansion should increase.

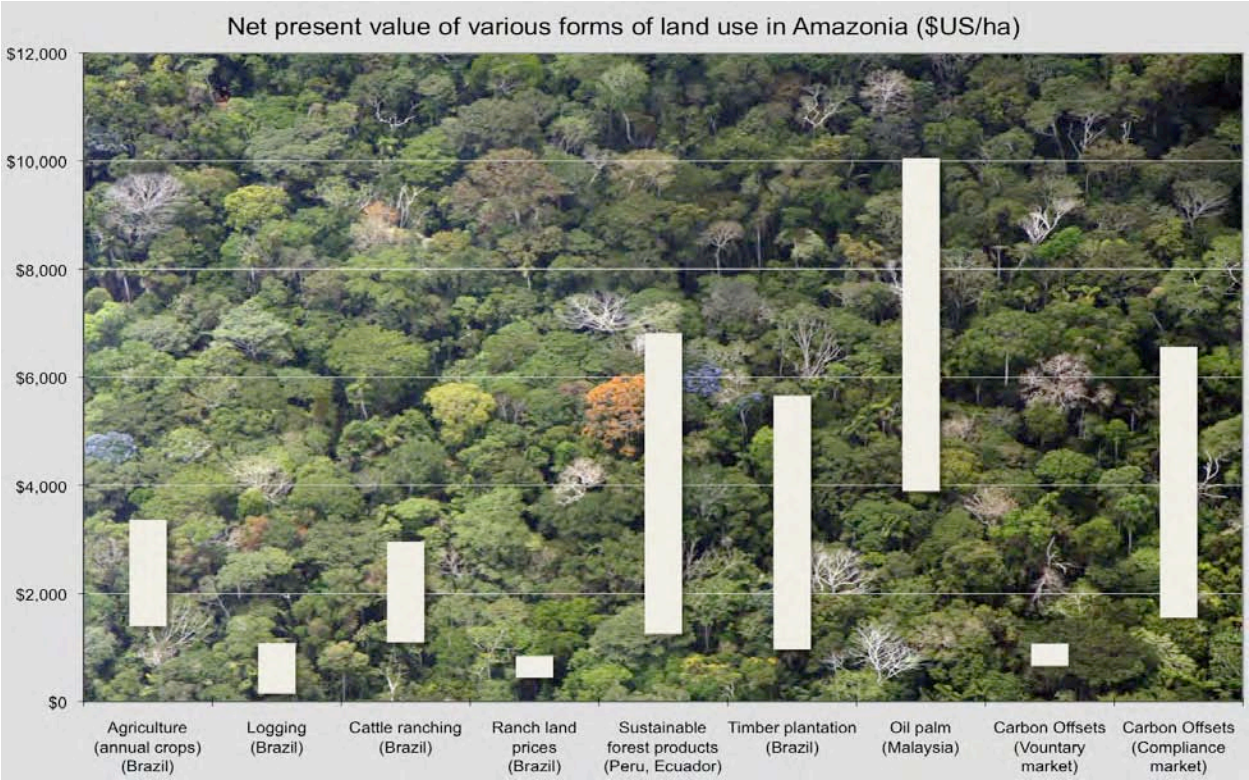

Fig. 2. Net present value of different forms of land use in the tropics. Net present value ($US) – defined as the total present value of income generated from land use for a particular activity – for mechanized agriculture [39,40], logging [41], cattle ranching [42,42], ranch land prices [41,42], sustainable forest products [41,43], timber plantation [41,49], oil palm [30], carbon offsets in voluntary markets [30, 44-46], and carbon offsets in potential compliance markets [30, 44-46]. Background image by R.A. Butler.

Third, Brazil is already a global leader in biofuel production, using sugarcane to produce large quantities of ethanol for automobiles. The notion that it might move aggressively into a second realm of biofuel—using palm oil to make biodiesel—enjoys considerable political and public support [15]. Brazil is already considering a law [15] that would allow oil palm plantations in the Legal Amazon to count towards a landowner's requirement to maintain a

"legal reserve" of forest (at present, Amazonian landowners are nominally required to retain 80% of their properties as forest, although this law is rarely enforced; [16]). The Brazilian Ministry of Agriculture estimates that this measure, along with other incentives, could boost the area under oil palm dramatically—by 100-fold, from 60,000 to 6 million ha—ushering in a major new wave of development in the region [15].

Finally, the influence of Asian oil palm corporations, which have much experience in cultivating, processing, exporting, and marketing palm oil, is rapidly increasing in Amazonia. Malaysian producers, for example, have recently announced several new Amazonian projects [17], including 100,000 ha of plantations near Tefé in the Brazilian state of Amazonas [18]. Felda Global Ventures Brazil, a joint Brazilian-Malaysian corporation established to produce oil palm in the Amazon, has already announced its intent to become a "global player" in the oil palm industry [18]. Although political sensitivities in Brazil could preclude Asian firms from directly cultivating large expanses of oil palm in Amazonia, the aggressive approach, capital, and technology transfer from such firms could help make large-scale oil palm expansion a reality in the region.

Implications for conservation

We have many concerns about the potential environmental impacts of oil palm agriculture in Amazonia (see [1; 3; 5] for recent reviews). Among the most important is the strong tendency for landowners to establish oil palm plantations on primary-forest lands (Fig. 3, Fig. 4), when available, rather than on degraded or previously cleared lands [3]. By doing so, landowners can reap immediate profits from timber harvests in primary forest [1]. These profits are often crucial to offsetting the costs of plantation establishment and maintenance during the initial 3-5 years until the oil palm plantations become productive. This economic reality stands in direct contrast to recent suggestions by the Brazilian Minister for the Environment, Carlos Minc, that oil palm expansion in Amazonia would be concentrated on previously cleared lands [15].

A related issue is that, even if plantations were somehow confined to cleared lands in Amazonia, many of these areas are actively being used for agricultural production. In effect, displacing the current landowners might simply push croplands and livestock production further into the frontier, helping to maintain strong pressures for forest conversion in remote areas [1]. Such displacement is already occurring on a large scale in Amazonia as industrial soy farmers buy up and displace many ranchers and small-scale farmers [19; 20].

Among the greatest concerns is that oil palm plantations are biologically impoverished, even relative to heavily logged forests in the tropics [1; 3; 5; 21; 22]. In peninsular Malaysia, for example, Koh & Wilcove [3] found a 77% decline in bird species richness and an 83% decline in butterfly richness in oil palm plantations, relative to old-growth forest. Across all surveyed taxa, oil palm plantations contain only 15% of the plant and animal species found in primary tropical forests [1]. Palm oil monocultures also typically require use of insecticides, herbicides, rodenticides, and fertilizers that enter streams as runoff and can have serious impacts on aquatic biodiversity [1]. Hence, large expanses of oil palm could function as biological deserts and contribute to fragmentation of remaining forest and degradation of aquatic habitats.

Fig. 3: Oil palm plantation adjacent to tropical forest in Sabah, Malaysia. Photo by R. A. Butler.

Key ecosystem services are also seriously diminished in oil palm plantations. On average, such plantations store less than 40% of the carbon found in native forests (assuming typical above-ground carbon values of 75 tons ha^{-1} for oil palm plantations and 200 tons ha^{-1} for native forest; [23-25]). At present, intact forests in the Amazon are a massive carbon stock, with forested lands suitable for oil palm storing around 42 billion tons of carbon [4], an amount equivalent to all global, anthropogenic carbon emissions for six years. Thus, large-scale expansion of oil palm production into forested areas could have serious, long-term impacts on carbon storage [25; 26] and other ecosystem services in the Amazon.

Finally, large-scale expansion of oil palm would reduce the effectiveness of current conservation initiatives in Amazonia. In particular, by driving up land demand and prices, expansion would reduce the viability of ecosystem-services payments, such as carbon offsets, that could provide incentives for landowners to leave forest standing [27-30]. Oil palm expansion could, for example, have an immediate and negative impact on forest-conservation initiatives in the Brazilian state of Amazonas, which has been a leader in using carbon-offset payments to promote conservation by small-scale landowners.

Fig. 4. Oil palm plantation adjacent to tropical forest in Sabah, Malaysia. Photo by R. A. Butler.

Policy Measures

As the world's highest-yielding oilseed, oil palm can generate higher financial returns and larger quantities of vegetable oil per unit area than does soy, the dominant oil crop in Amazonia. Oil palm plantations also typically employ more workers than do soy farms or cattle ranches. Thus, if oil palm could somehow be restricted to disused farmlands or ranchlands (without displacing the former landowners to forest frontiers), the Amazon region would benefit more economically and environmentally than it would under expanding soy or cattle pastures. As discussed above, however, we regard such a benign scenario as being highly unlikely.

Nonetheless, some environmental impacts of oil palm expansion in Amazonia could be reduced with effective mitigation measures. Better enforcement of existing Brazilian environmental laws—including maintaining legal forest reserves and riparian buffer zones on private lands—could limit oil palm expansion into primary forest. Such efforts might be aided by new Brazilian initiatives to reduce net deforestation [31] and to seek international financing for sustainable development [32]. As discussed above, however, landowners have strong economic incentives to exploit primary forest for oil palm, which will be greatly amplified if such plantations are allowed to count towards a landowner's legal requirement to maintain part of their property under native-forest cover. This, in concert with the daunting logistical challenges involved in monitoring and policing the vast Amazonian frontier [33], means that efforts to confine oil palm to previously deforested lands will be an uphill battle.

The behavior of oil palm producers in Amazonia could be influenced by both carrots and sticks. As a carrot, the Brazilian government could develop financial incentives, such as low-interest loans and tax breaks, for responsible developers who confine their plantations to agricultural or abandoned lands cleared before a specified date. Ecosystem-services payments to landowners might also be helpful, particularly when carbon storage is increased

by establishing oil palm on abandoned pastures or farmland. As a stick, environmental organizations could pressure corporations who purchase unsustainably produced palm oil from Amazonia or elsewhere [34]. The current moratorium on soy production on Amazonian lands deforested after October 2006 might serve as a model (http://www.abiove.com.br).

Palm oil production causes substantial air, water, and land pollution, some of which can be reduced by adopting production methods proposed by the Roundtable on Sustainable Palm Oil (RSPO), an industry-led certification initiative to improve oil palm sustainability. These include using natural pest control and composting in place of synthetic pesticides and fertilizers whenever possible, implementing no-burn policies for waste at palm oil mills, and creating catchment ponds to prevent mill effluents from directly entering waterways, where they would damage aquatic habitats ([35]; http://www.rspo.org). Further deleterious impacts of oil palm plantations, such as forest fragmentation, can be reduced somewhat by establishing primary-forest corridors, riparian strips, and small reserves within plantations [36; 37]. To encourage such measures for industrial operators, the Brazilian government could develop policy measures to ensure that any investors are truly plantation companies—rather than timber companies— and members of the RSPO.

Conclusions

Oil palm agriculture could soon be a major emerging threat to the Amazon. In concert with massive expansion of Amazonian cattle ranching [38] and soy farms [13], it could sharply increase economic incentives favoring destruction of Amazonian forests. Conservation interests must prepare to deal with this new challenge, which could potentially have serious economic, social, and environmental impacts. Particularly urgent is a need to confront recent political and corporate assertions in Brazil that massive oil palm expansion would occur almost solely on deforested lands without threatening native ecosystems—an argument clearly divorced from economic and biological reality.

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