The health, environmental and economic benefits of palm oil

by **Hiroko Shimizu,** associate researcher at the Institut économique Molinari
Pierre Desrochers, associate professor at the Department of Geography
University of Toronto Mississauga

Oils and fats have been essential components of human life for thousands of years, whether as a source of food, illumination, soap, or as lubricants for machinery.[1] At the turn of the 20th century, improvements in refining technologies and long distance transportation turned palm oil into a globally traded commodity and a dominant force in the global vegetable oil market.[2] According to USDA data, in 2011/12 palm oil contributed 32.7% of the world vegetable oil supply, the bulk of which (above 85%) was produced in Malaysia and Indonesia.[3]

Palm oil has long been denigrated by its opponents (who were often historically producers of potential alternatives) as being "impure, unhealthy, outright dangerous, and a threat to the environment."[4] As with all other agricultural productions in history, palm oil production takes place on formerly "wild" land. Western non-governmental organizations (NGOs) such as Friends of the Earth and Greenpeace have been especially active in denouncing the expansion of this industry as the cause of massive deforestation and the extermination of charismatic species such as orangutans.[5]

In the meantime, the World Wildlife Fund published its "Palm Oil Buyers' Score Card 2011" which assessed the palm oil buying practices of 132 major retailers and consumer goods manufacturers.[6]

Their campaigns have affected many corporate policies. Nestlé excluded the Indonesian paper and palm producer Sinar Mas Agro Resources and Technology from its supply chain. Since 2010 Carrefour has purchased Green Palm certified oil for its own brand products sold in France and has committed itself to purchasing only Certified Sustainable Palm Oil by 2015.[7] For its part, Casino banned palm oil from all its food products for health considerations while committing itself to purchasing only certified "sustainable" supplies for its other (i.e., non-food) products.

However, we will argue that while not perfect, palm oil displays a number of advantages over actual and potential alternatives in terms of its versatility, productivity, price and volume availability that does indeed make it a superior product in many respects. Boycotting palm oil would fail to deliver any environmental and economic benefits while severely hurting the growth prospect of impoverished communities.

HEALTH AND NUTRITIONAL VALUE

Commercial palm oil is extracted from the fruit of the oil palm tree (*Elaeis guineensis*) native to West Africa, a botanical relative of the coconut.[8] Palm oil use goes back at least 5,000 years to ancient Egypt,[9] but only became a truly global commodity over a century ago when its production took off in other parts of the world characterized by tropical climates with high annual rainfall located within 10° of the equator.[10]

The oil palm produces two very different types of oils: crude palm oil (CPO) from the fibrous mesocarp[11] and crude palm kernel oil (CPKO) from seed kernels whose composition is actually closer to coconut oil.[12] Between 80 and 90% of palm oil production is destined for human food consumption either as frying and cooking oil or as an ingredient in a wide range of food products. The remaining 10% is consumed by various industries, from biodiesel to cosmetics and pharmaceutical producers. The most unique property of palm oil when compared to its most common alternatives (typically rapeseed and soybean oils) is that it is semi-solid at room temperature with a specific origin melting point between 33°C to 39°C, which derives from its about 1:1 ratio of unsaturated to saturated fatty acids.[13] In practice, it makes it very easy to work with.

1. Berger, K. G and S. M. Martin. 2000. Palm oil. *The Cambridge World History of Food*. In Eds. Kenneth F. Kiple and Kriemhild Coneè Ornelas. Cambridge University Press. Chapter II. E. 3. p. 397.
2. Ibid.
3. USDA Foreign Agriculture Service. *Production, Supply and Distribution Online*. http://www.fas.usda.gov/psdonline/ The nine major vegetable oils in this dataset are coconut, cottonseed, olive, palm, palm kernel, peanut, rapeseed, soybean, and sunflower oil.
4. Gustafsson, Fredrik. 2007. *The Visible Palm: Market Failures, Industrial Policy and the Malaysian Palm Oil Industry*. Almqvist & Wiksell International. p. 87
5. Greenpeace. 2007. *Cooking the Climate*. Greenpeace UK Report. http://www.greenpeace.org/international/en/news/features/palm-oil_cooking-the-climate/
6. WWF. 2011. *Palm Oil Buyers' Score Card. Measuring the Progress of Palm Oil Buyers*. http://wwf.panda.org/what_we_do/footprint/agriculture/palm_oil/solutions/responsible_purchasing/scorecard2011/
7. Roundtable on Sustainable Palm Oil. 2012. Carrefour Launches First RSPO Trademarked Cooking Oil in Indonesia, RSPO newsletter, July 12. http://www.rspo.org/news_details.php?nid=114
8. Wood. B. J. 1987. Growth and production of oil palm fruits In Gunstone. F. D. ed. , *Palm oil*. Critical Reports on Applied Chemistry Volume 15. John Wiley & Sons. p. 12.
9. Berger, K. G and S. M. Martin. 2000.
10. Wood. B. J. 1987. p. 16.
11. Only olive oil and palm oil are extracted from the mesocarp (i.e., the fleshy middle layer of the pericarp of a fruit, between the exocarp and the endocarp).
12. O'Keefe, Sean Francis. 2000. An Overview of Oils and Fats with a Special Emphasis on Olive Oil. *The Cambridge World History of Food*. Eds. Kenneth F. Kiple and Kriemhild Coneè Ornelas. Cambridge University Press. p. 381.
13. It contains 40% oleic acid (monounsaturated fatty acid), 10% linoleic acid (polyunsaturated fatty acid), 45% palmitic acid and 5% stearic acid (saturated fatty acid). Malaysia Palm Oil Council. http://www.mpoc.org.my/The_Oil.aspx

Palm oil has often been accused of being less healthy than other alternatives. To better understand the issue, however, one must first get acquainted with some basic nutritional facts.

Fats consist mainly of four types of fatty acids: polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA), saturated fatty acids (SAFA) and trans fatty acid (TFA). In France and elsewhere, the use of palm oil in food preparation has been criticized because it contains saturated fatty acids which can increase unhealthy LDL cholesterol levels. [15]

However, palm oil is a healthier source of solid fats than hydrogenated vegetable oils. Contrary to soybeans or rapeseed oils which need to be hydrogenated in order to become solid or semi solid, palm oil is already solid at room temperature and is thus less prone to oxidation.

It is in the process of partial hydrogenation that artificial trans fatty acids are formed. The intake of trans fats has been linked to heart disease, increased levels of unhealthy LDL (low density lipoprotein) cholesterol and lowered levels of good HDL (high density lipoprotein) cholesterol. Thus, the fact that palm oil is "trans fat free" makes it a valuable substitute for many animal fats like tallow or other partially hydrogenated vegetable oils.

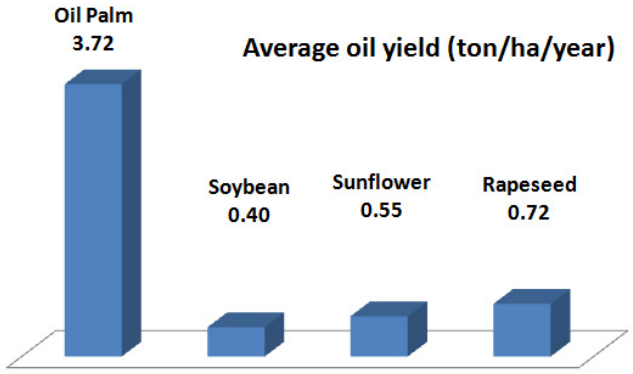
In general, zero trans fatty acids, less saturated, and more mono and polyunsaturated fatty acids in oil are healthier options.[16] However, products rich in saturated fats have other qualities such as better oxidative stability, being creamier, and a high melting point to make this necessary ingredient especially for confectionary manufacturers.

Practically, there are significant tradeoffs as less saturated fats means less functionality, less flavor and texture, less stability and higher costs. Once all tradeoffs are factored in, palm kernel oil, palm oil, or a blend of these with other liquid oils are typically the most practical and economical options. For example, there is a growing demand for palm kernel oil products as ingredients in the production of non-hydrogenated trans-fat free margarine.[17] It is the dose that makes the poison.

Palm oil is also stable at high heat and rich in anti-oxidants, carotenes (vitamin A) and vitamin E. Among other advantages, these characteristics make it ideal for frying, to extend the shelf life of the food products in which it is used, and to significantly boost the nutritional and health content of foods, especially in developing countries.[18] Apart from food usages, tocotrienols (a type of vitamin E) is found in abundance in palm oil. It is used, among others, by the high-end cosmetics manufacturer Crabtree & Evelyn as an active ingredient to increase sunscreen efficiency by reducing UV ray penetration which can cause cellular ageing.[19] Because of innovations in processing and reformulation, there is an increasingly wide range of uses for palm oil products.

Figure 1

Average annual oil yield, world production and planted area for major edible oil crops



Oil Crop	Average oil yield (ton/ha/year)	Planted area (million hectare)	% of total planted area	Production (million tons)*	% of total production
Oil Palm	**3,72**	**13,58**	**5,35**	**55,88**	**36,3**
Soybean	0,40	103,9	40,92	41,41	26,9
Sunflower	0,55	23,99	9,45	13,24	8,6
Rapeseed	0,72	33,07	13,02	23,71	15,4
Others		79,38	31,26	19,71	12,8
Total **		253,92		153,95	

Source: Oil World Database (June 2012). *MPOC, Palm Oil Fact Slides 2011. ** Total for 10 major oilseed crops.

LOW INPUTS, LOW LAND USAGE AND HIGH YIELDS

From 1980 to 2011, the annual world production of palm oil more than decupled, from 4.5 million tons to 55 million tons.[20] Much of this expansion took place in Indonesia and Malaysia because of good growing conditions, greater productivity of palm oil over potential alternatives and advances in cultivation, refining and transportation technologies.[21] In 2011, Malaysia and Indonesia produced over the third of the total global edible oil supply using only 5.5% of oilseed planted area, a result entirely attributable to the high productivity of palm oil production.[22] According to Oil World 2007 data, oil palm yields an average of 3.72 tons of oil per hectare compared to 0.40 tons and 0.72 tons respectively for soybean and rapeseed.[23] In other words, oil palm trees produce almost 10 times more oil per hectare than soybean and more than 5 times more oil than rapeseed (Figure 1).

In terms of unit of input per unit of output, oil palm also requires significantly less fertilizers, pesticides and fuel per unit produced than rapeseed and soybean, in the end delivering over three times more oil per unit of input (Figure 2).[24]

14. European Federation for Vegetable Oil and Proteinmeal industries (FEDIOL), *Facts on Fats*, http://www.fediol.be/data/1330349750TRYPT%20FACTS%20ON%20FAT.pdf
15. Miserey, Yves. 2010. L'huile de palme, mauvaise graisse omniprésente, Le Figaro, February 9. http://sante.lefigaro.fr/actualite/2011/02/09/10727-lhuile-palme-mauvaise-graisse-omnipresente
16. European Federation for Vegetable Oil and Proteinmeal industries (FEDIOL), Innovation in Processing and Reformulation of Vegetable Oils and Fats, FEDIOL Nutrition Factsheet. http://www.fediol.eu/data/1324550245Factsheet%20Innovation%20in%20processing%20%26%20reformulation%209Dec11.pdf
17. MPOC. The Oil. http://www.mpoc.org.my/The_Oil.aspx
18. Malaysia Palm Oil Board. http://econ.mpob.gov.my/economy/exporters/EID_exporter.htm
19. Tee Ching. 2012. Palm Oil's 'secret, bountiful yield'. *New Sunday Times*, April 22.
20. Corley, Hereward and Tinker, Bernard. 2003. *The Oil Palm* (4th Edition). Blackwell Science. p. 13.
21. Berger, K. G and S. M. Martin. 2000 and Erixon, Fredrik. 2012. *The Rising Trend of Green Protectionism: Biofuels and the European Union*. ECIPE Occasional Paper. No. 2/2012 European Center for International Political Economy. p. 18.
22. MPOC. Palm Oil Fact Slides, Resource Centre. http://www.mpoc.org.my/Palm_Oil_Fact_Slides.aspx
23. Oil World. Oil World Statistics by ISTA Mielke GmbH. http://www.oilworld.biz/app.php?ista=3e29384f7d8b6ed120a26459abe5fd4e
24. Wood B. J. et al. 1991. The energy balance of oil palm cultivation, *Proceedings of the 1991 PORIM International Palm Oil Conference*.

Along with this high productivity, South East Asian and South American countries have also the lowest production costs for edible oil crops (EU and other countries have higher costs attributable to a range of factors, from high fertilizer usage and overhead costs to higher taxation).[25] According to Oil World, crude palm oil price was on average 10% to 30% lower than soybean and rapeseed oils.[26]

Another advantage of oil palm production is the relative reliability of its supply. While all large-scale agricultural productions are subjected to some degree to various natural hazards (from droughts and floods to frost and hurricanes), oil palm, a perennial plant that is productive year round and has a useful life of between 20 to 25 years, is typically more reliable than its (annual plant) alternatives. It has also benefitted from modern breeding techniques and ever more sophisticated production technologies that have delivered an ever more affordable, versatile and high quality supply. The obvious advantages of palm oil, especially in terms of productivity, volume, price and versatility, explain its success in world markets.

PALM OIL AND DEFORESTATION

All agricultural activities ultimately require the conversion of what were once "wild" areas. In many cases, however, the increased production of a particular agricultural commodity can be achieved by switching productions on a plot of land that is already being used. This has been the case for palm oil.

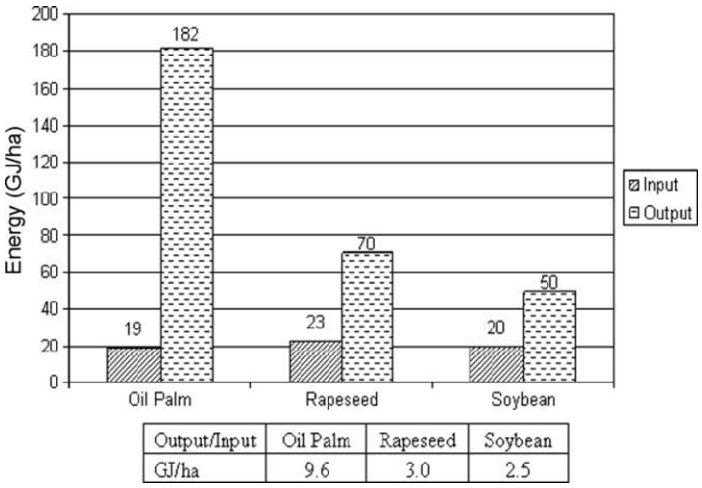
In Malaysia for instance, the surface area devoted to palm oil production in 2011 was about 5 million hectares, a fivefold increase since 1975. Approximately 1.39 million of these hectares were the result of conversion from other tree crop productions such as rubber, cocoa, and coconut. It is also worth pointing out that while the surface area devoted to palm oil production increased by a factor of five, total production increased more than 16 times between 1975 to 2011 (from 1.1 million ton to 16.6 million tons) because of much higher yields.[28] A case can thus be made that improvement in yields since 1975 actually "spared" perhaps as many as 15 million hectares of land to achieve the 2011 production volume.

Activists from advanced economies who are quick to denounce deforestation in faraway lands should also keep in mind that, far from being a recent occurrence, perhaps as much as nine-tenths of all deforestation caused by human beings since the emergence of civilization occurred before 1950. Indeed, people needed to clear massive amounts of forested land in order to provide themselves with shelter, food, warmth and a multitude of objects.[29]

The significant increase in the use of coal in the early decades of 19th century, however, marked the beginning of a reversal of this trend which was later accelerated by the advent of natural gas and petroleum. These not only acted as substitutes for the use of biomass fuels, but also drastically improved agricultural productivity and eliminated farm animals, which consumed a significant portion of agricultural crops.

Figure 2

Energy input and output ratio[27]



Output/Input	Oil Palm	Rapeseed	Soybean
GJ/ha	9.6	3.0	2.5

France was perhaps the first major country to experience what has since been termed a "forest transition" as its forest area expanded by one-third between 1830 and 1960, and by a further quarter since 1960. Similar processes, although of varying intensity and scope, have been occurring in all major temperate and boreal forests and in every country with a per capita Gross Domestic Product exceeding US $4,600 as well as in some developing economies, most notably China and India.[30]

Tropical rain forests and orangutans will not be better protected with punitive measures to slow down the development of palm oil producing countries, but rather through a sustained increase in the productivity and sustainability of their crops. Only with a more efficient use of land and increased wealth will they be better able to devote more resources to the protection of those ecosystems. Fortunately, with economic development and its attending productivity gains, and development of substitute products, reforestation has become a dominant pattern in all advanced economies.

THE CONSEQUENCES OF A BOYCOTT

World population growth, improved standards of living and biofuel mandates mean that the demand for vegetable oil is bound to increase significantly in coming decades. Any deliberate move to reduce palm oil production in locations like Malaysia and Indonesia thus inevitably implies a shift in production towards lower yielding and more expensive substitutes. These would have a few unavoidable consequences:

25. Erixon, Fredrik. 2012. *The Rising Trend of Green Protectionism: Biofuels and the European Union*. ECIPE Occasional Paper. No. 2/2012. European Center for International Political Economy. p. 19.
26. Oil World. Oil World Statistics by ISTA Mielke GmbH. http://www.oilworld.biz/app.php?ista=3e29384f7d8b6ed120a26459abe5fd4e
27. Wood B. J. et al. 1991. The energy balance of oil palm cultivation, *Proceedings of the 1991 PORIM International Palm Oil Conference*.
28. MPOC. Palm Oil Fact Slides, Resource Centre. http://www.mpoc.org.my/Palm_Oil_Fact_Slides.aspx
29. Williams, Michael. 2001. The history of deforestation. *History Today* (July), pp. 30-37. For a more scholarly treatment, see Williams, Michael. 2002. *Deforesting the Earth*. University of Chicago Press.
30. Kauppi, Pekka E., Jesse H. Ausubel, Jingyun Fang, Alexander S. Mather, Roger A. Sedjo and Paul E. Waggoner. 2006. 'Returning Forests Analyzed with the Forest Identity. *Proceedings of the National Academy of Sciences* 103, (46): 17574-17579. http://www.pnas.org/content/103/46/17574.full.pdf+html.

1) Increases in land and resources requirements

Corley (2009) calculated several scenarios to meet future vegetable oil demand using various alternative sources of supply. According to his medium variant scenario in which 9.2 billion human beings in 2050 consume at least 25 kg per person per year of vegetable oil, the total global demand would be 240 million tons — about 40% more than is currently the case. Responding to this additional demand would require between 12 and 19 million hectares devoted to palm oil production or alternatively 95 million hectares devoted to soybean production.[31] Of course, as discussed above, soybean production would not only require significantly more land, but also more inputs such as fertilizers, pesticides, water and fuel.

2) Higher food prices and consumer items in the EU

Since palm oil is currently used in the production of many consumer products and foods items because of its lower price, a switch to costlier and less reliable substitutes would negatively affect both manufacturers and consumers.[32]

3) Undermining RSPO and sustainable palm oil sources

Sensationalistic anti-palm oil campaigns have tarnished the images of both the product and producers, resulting in retailers and manufacturers switching away from palm oil towards other substitutes. These campaigns can only undermine the market for certified "sustainable oil" at a time when the Roundtable on Sustainable Palm Oil has been struggling to expand its scope. In 2010 only 10% of the world's palm oil production (about 5 million tons) was certified "sustainable" and only half of that oil was sold on the market. Such hard and unnuanced views will hinder real progress in the industry and prevent, here and in developing countries, sustainable economic, environmental and social benefits.[33]

4) Delaying economic development in Malaysia and Indonesia

In both Malaysia and Indonesia, the palm oil industry represents a viable and significant growth industry. In Malaysia, the industry currently provides employment to more than half a million people, and livelihood to about one million people.[34] Any restrictions on this industry would primarily affect small farmers whose lack of alternative employment might incite them to increase less desirable activities such as (often illegal) logging.

CONCLUSION

Today, most activists justify their actions on environmental grounds and pressure manufacturers and retailers to give up on palm oil. Such an attitude, however, is short-sighted. It will ultimately fail to achieve the alleged broader goals of environmental remediation and improvements in the living standard of poorer populations, since no other source of vegetable oil than palm oil can actually spare more land and deliver more accessible, abundant and affordable calories to people worldwide.

Assuming that a significant increase in the demand for vegetable oil is a given, the real question then becomes how it can be met most efficiently, economically and sustainably. As with any other line of work, the real emphasis should be on encouraging better agronomic practices and improving governance in less advanced economies.[35] Whether legal or voluntary, sustainable policies also need to be based on sound science, be workable and verifiable throughout the supply chain.[36] Human ingenuity has long delivered and can continue to deliver ever greater output ever more efficiently, in the process providing both economic and environmental benefits. The palm oil industry is no exception.

31. Corley, R. H. V. 2009. How much palm oil do we need? *Environmental Science and Policy*. Vol. 12. Issue 2, pp. 134-139.
32. *FEDIOL Nutrition Factsheet*. p. 2.
33. Corley, R. H. V. 2009. How much palm oil do we need? *Environmental Science and Policy*. Vol. 12. Issue 2, pp. 134-139.
34. MPOC. http://www.mpoc.org.my
35. OECD-FAO. *Agriculture Outlook 2012-2021 Summary*. http://www.oecd.org/site/oecdfaoagriculturaloutlook/Summary%20of%20OECD%20FAO%20Agri%20Outlook%202012.pdf
36. FEDIOL. 2012. FEDIOL *Views on Sustainability*, May 03. http://www.fediol.eu/data/fediol_10ENV104_3494.pdf

Hiroko Shimizu is a policy analyst who holds a Master's of International Public Policy from the University of Osaka (Japan). She was an International Fellow at the Johns Hopkins University Institute for Policy Studies (USA), a Research Fellow at the Property and Environment Research Center (USA). She has published in three languages (Japanese, English and French) in both the academic and popular literatures.

Pierre Desrochers is Associate Professor of Geography at the University of Toronto Mississauga. His research and teaching activities focus primarily on economic development, technological innovation, entrepreneurship, international trade, business-environment and business-university interactions. His other areas of expertise include intellectual property and urban and housing policy.

They are both associate researchers with IEM.

*The **Institut économique Molinari** (IEM) is an independent, non-profit research and educational organization. Its mission is to promote an economic approach to the study of public policy issues by offering innovative solutions that foster prosperity for all.*

Director General: Cécile Philippe
Design: Gilles Guénette
www.institutmolinari.org