



ESSENTIAL OIL?

Palm oil is omnipresent in global consumption. But in many circles it is now considered the scourge of the natural world, for the deforestation and habitat destruction which follows its production. Chris Fitch explores the truths behind palm oil's negative reputation, to see if this ubiquitous crop deserves to be treated with such disdain

In case it needs repeating: palm oil is now comfortably the most consumed vegetable oil in the world. You probably devour it every single day, often without a second thought. It's almost definitely in the soap you wash with in the morning, in the cereal you eat for breakfast, in the sandwich you have for lunch, and in the biscuits you snack on during the day.

What is perhaps even more remarkable is the enormous growth in palm oil production. From a mere two million tonnes being produced annually globally half a century ago, and only five million tonnes even by the early 1980s, there are now around sixty million tonnes being produced every single year, a figure looking likely to double or even triple by the middle of the century.

Why is palm oil so attractive for manufacturers? Primarily because its unique properties – such as remaining solid at room temperature – make it an ideal ingredient for long-term preservation, allowing many packaged foods on supermarket shelves to have 'best before' dates months, even years, into the future.

If Nestlé, Unilever, Kellogg's, PepsiCo, Kraft or any other major manufacturer could invent the perfect oil to add into their processed products, chances are they would create palm oil. In the vast economies of India and China, the escalating consumption of everyday packaged foodstuffs such as instant noodles has led to enormous demand for the palm oil which keeps these and other consumables 'shelf-fresh'.

AREAS OF CONCERN

Many farmers, particularly in Indonesia and Malaysia, have consequentially seized the opportunity to maximise the planting of oil palm, the tree that grows in warm and wet conditions and can be harvested for highly profitable palm oil. Between 1990 and 2012, the global land area devoted to growing oil palm grew from six to 17 million hectares, now accounting for around ten per cent of total cropland in the entire world. Globally palm oil has cornered the market.

However, there are multiple reasons why conservationists repeatedly cite the rapid spread of oil palm as a major concern. It isn't necessary to dip too far into environmental news to find multiple stories of deforestation, biodiversity loss, habitat destruction and dwindling species populations, all as a direct result of land clearing in order to plant oil palm monoculture on an industrial scale (it's estimated that between 1990 and 2010, 17 per cent of new oil palm plantations in Malaysia, and a whopping 63 per cent of those in Indonesia, came at the direct expense of biodiversity-rich tropical forests). Forest fires started by aspiring oil palm growers have decimated virgin rainforest in recent years, most famously in the summer of 2015, when much of Southeast Asia

declared a public health crisis due to the air pollution produced by immense fires burning across Borneo and Sumatra. Endangered species – most famously the Sumatran orang-utan, but also rhinos, elephants, tigers, and numerous other fauna – have suffered from the unstoppable spread of oil palm plantations.

'Palm oil is surely one of the greatest threats to global biodiversity,' declares Dr Farnon Ellwood, Senior Lecturer in Environmental Biology at UWE Bristol. 'Palm oil is replacing rainforest, and rainforest is where all the species are. That's a problem.'

None of the above is particularly new information. Predominantly it has been a continuation of trends known for a decade or more (see *Seeds of Destruction* in *Geographical's* March 2006 issue, for a breakdown of the situation nearly 12 years ago). Land clearing has continued to escalate – by 40 per cent and 150 per cent for Indonesia and Malaysia respectively over the last decade – while the geographical expansion of oil palm plantations into new countries around the tropics, such as Nigeria and surrounding West Africa, and Ecuador and neighbouring South American countries, is now threatening to migrate these destructive habits to new continents. It's led to some radical questions among environmentalists, such as whether consumers should try to boycott palm oil entirely.

Health

■ The health implications of consuming vast quantities of palm oil have more recently entered the public consciousness, as consumers have slowly woken up to the scale of consumption. Palm oil is very high in saturated fats (more so than most of the oils it tends to replace, such as sunflower, soybean or mustard) and low in polyunsaturated fats, which are believed to help lower cholesterol.

The debate around the health impacts of saturated fats in human diets is ongoing, with the previously agreed position that they are responsible for much of the world's cardiovascular diseases now being challenged by recent research that suggests them to be far less detrimental (other highly saturated fats, such as coconut, are even being marketed as a healthy 'superfood').

The possibility that saturated fats might not be as harmful as previously believed has led to the suggestion that switching to palm oil in foods currently containing trans fats – which are objectively bad for human digestion – could bring health benefits. However, such an idea has been dismissed by the US Department of Agriculture, which argues that palm oil would not be a healthy substitute.

Professor Bhavani Shankar, Professor of International Food, Agriculture and Health at the Centre for Development, Environment and Policy, SOAS, believes that a general policy of reducing consumption of highly saturated fats such as palm oil would broadly reduce the risk of cardiovascular disease. 'The real question,' he insists, 'is what are you substituting the palm oil with?'



A palm oil processing plant in Malaysia

TOP 10 PALM OIL PRODUCERS (2013)

Source: FAO

Indonesia	26,895,500 tonnes
Malaysia	19,216,460 tonnes
Thailand	1,970,000 tonnes
Colombia	1,040,835 tonnes
Nigeria	880,000 tonnes
Papua New Guinea	485,000 tonnes
Honduras	425,000 tonnes
Côte d'Ivoire	415,000 tonnes
Guatemala	402,000 tonnes
Brazil	340,000 tonnes



Harvesting palm oil in Malaysia

LIQUID GOLD

'It's easy to say that palm oil is the enemy and we should be against it,' argues Bhavani Shankar, Professor of International Food, Agriculture and Health at the Centre for Development, Environment and Policy, SOAS. 'It makes for a more dramatic story, and it's very intuitive. But given the complexity of the argument, I think a much more nuanced story is closer to the truth. Palm oil has a role to play, certainly, in many countries.'

For a number of years, Shankar has been co-lead on POSHE (Palm Oil: Sustainability, Health and Economics), a Wellcome Trust-funded project to measure the key impacts of palm oil production, and the trade-offs required to make all three work together. For example, the millions of people whose livelihoods now depend on growing and harvesting oil palm (more than four million in Indonesia alone) has created a difficult discussion over how socially-minded individuals and institutions should respond to the palm oil boom.

One response to the 'boycott palm oil' movement has been the argument that, while the environmental impacts of this commodity may not be to our tastes,

the vital economic role it plays in lifting many millions of people in the developing world out of poverty makes it all worth it.

'People in Southeast Asia think of palm oil as liquid gold,' explains Dr Ellwood. 'It's by far their most importantly traded commodity. Everyone's growing it, whether you're a large plantation owner, or a smallholder with a couple of acres in your garden. For smallholders, those few oil palm trees make the difference between your family being able to buy a car or house, and your kids being able to go to school or not. It's completely revolutionised the socio-economic fortunes of those countries.'

Is it desirable to have palm oil boycotted, replaced, eliminated from the global supply chain, given how many low-income people in developing countries depend on it for their livelihoods? Striking a utilitarian balance between these competing factors has become a serious bone of contention.

SCALED GROWTH

Even the environmental argument isn't as straightforward as it may seem. Oil palm is an incredibly high-yielding crop, producing at least four and potentially

up to ten times more vegetable oil per hectare than soybean, rapeseed, sunflower or other competing oils. That immensely high yield – which is predominantly what makes palm oil so profitable – is potentially also an environmental benefit. If ten times more palm oil can be produced from a patch of land than of any competing oil, then ten times more land would need to be cleared in order to produce the same volume of oil from that same competitor. Therefore, to minimise land clearing, a concentrated, restrained practice of palm oil production might be an ideal solution.

Of course, forest clearing is about far more than just the destruction of wildlife habitats. There is also the highly important issue of carbon emissions, the growth of which continue to fuel the progression of climate change.

'The minute you allow deforestation to happen, then your greenhouse gas emissions just grow through the roof,' explains Shankar. 'Keeping it at a small scale is key. For small-scale farmers growing oil palm, if the water management is reasonable, if a lid is kept on the scale, and it's not allowed to get into deforestation... if it is actually possible to do that, then it is like any other agricultural commodity, an attractive cash crop in that part of the world.'

As Shankar explains, the issue really comes down to the substitution. If, instead of highly biodiverse primary rainforest, oil palm is replacing land degraded by rice paddies or rubber plantations, this may result in a noticeable environmental benefit, as well as an economic one.

'People say that palm oil causes deforestation, but in terms of greenhouse gas emissions it's somewhere really in the middle' he continues. 'It actually sequesters more carbon in some ways than other alternatives. So the question is, what else happens to the land that it's supposed to be growing in? Of course if you're cutting down virgin forest it's terrible, that's what's happening in Indonesia and Malaysia, it's been allowed to get out of hand. But if it's replacing rice, for example, it might actually sequester more carbon. So the story needs to be more nuanced.'

Shankar points to Thailand – where he has been conducting POSHE – as a country which has learnt the lessons from its neighbours about how not to let the spread of oil palm production get out of control. The Thai method of keeping plantations small in scale has been key to preventing them from rapidly expanding into the primary rainforest, as has occurred in neighbouring countries. 'I think it has done a good job, but it's done it by being very interventionist. Whether there is enough political will in other countries to do that, I don't know. It does require a lot of strategic thinking and optimising, bringing parties together, and keeping a close eye on deforestation.'

The key question, therefore, is whether the new countries oil palm plantations are spreading to – whether they are in South Asia, West Africa, South America, or elsewhere – have a sufficiently high level of oversight from national governments in order to regulate the size and growth of oil palm plantations. The health of their natural biodiversity may depend on it.

Biofuel

■ There is one other significant usage for palm oil which is taking off: biofuel. Encouraging a switch from fossil to biofuels, especially by the European Union ten years ago (by 2020, the EU aims to have ten per cent of transport fuel in every EU country come from renewable sources such as biofuels), has been criticised by numerous environmental groups that argue it pushed up food prices for many of the world's poor (an accusation the EU rejects). Nevertheless, away from Europe, it is becoming a popular source of electricity generation and a growing alternative destination for oil palm products.

'Palm oil is not necessarily the most efficient biofuel in the world,' explains Bhavani Shankar, professor at the Centre for Development, Environment and Policy, SOAS. 'There are other competing commodities that will do a much better job. But its use as a biofuel is quite prominent in Southeast Asia. The high yield makes a big difference in terms of overcoming the relative inefficiency of the conversion. It's indigenous, and there is a long tradition of growing oil palm, so they are willing to accept this as a biofuel in spite of its inefficiencies.'

Research conducted recently by the University of Surrey found that just one small-to-medium palm oil mill in Malaysia would be capable of reducing the country's carbon emissions by up to 5,500 tonnes per year.

CHANGING BEHAVIOURS

For many people, the key question with regards to palm oil is simple: if I can't avoid it entirely, can I purchase products that I know contain palm oil which is less environmentally damaging? Questions persist about what can be reliably termed 'sustainable' palm oil, especially in regions which have previously experienced devastating clear-cutting in order to create the desired agricultural land.

Nevertheless, over the past decade or so, there has gradually formed an agreement regarding what hoops producers of palm oil should be made to jump through in order for it to become officially 'sustainable'. The Roundtable on Sustainable Palm Oil (RSPO), as close as there is to a universal body in this industry, consisting of oil palm growers, retailers, NGOs, product manufacturers, and many other interested parties, insists upon no primary forest clearing, clear transparency, limited planting on peatlands, and regular carbon stock assessments, among other criteria. Only once these requirements have been fully satisfied, is the oil allowed to be sold as certified sustainable palm oil (CSPO).

'We would always say that, rather than boycott, work harder to increase demand of sustainable palm oil,' argues Danielle Morley, European Director of Outreach and Engagement at RSPO. 'If a lot of Europe stopped buying palm oil – and we're basically



TOP 20 IMPORTERS OF PALM OIL (2013)

Source: FAO



India	8,389,672 tonnes
China, mainland	5,978,515 tonnes
Netherlands	2,932,058 tonnes
Pakistan	2,248,607 tonnes
Germany	1,457,767 tonnes
Italy	1,392,215 tonnes
USA	1,373,179 tonnes
Nigeria	1,195,300 tonnes
Bangladesh	1,026,757 tonnes
Iran	997,300 tonnes
Spain	902,789 tonnes
Russian Federation	746,579 tonnes
Malaysia	718,502 tonnes
Egypt	707,124 tonnes
Singapore	615,397 tonnes
Myanmar	605,400 tonnes
Belgium	602,035 tonnes
Kenya	593,882 tonnes
Turkey	592,056 tonnes
Japan	591,165 tonnes



the main market for sustainable palm oil – then producers would have no incentive to improve their practices to become sustainable, and just continue business as usual and sell to those markets that don't value sustainably as much as we do. So it displaces the problem, it doesn't solve it at all.'

The latest figures show that the RSPO now certifies around 12 million tons of palm oil annually, equivalent to roughly 21 per cent of the world's total palm oil production. RSPO-certified plantations cover an area of 2.53 million hectares, just over half of which are in Indonesia, around 42 per cent in Malaysia, and smaller contributions made by other countries such as Papua New Guinea, Colombia, and Brazil. The RSPO acknowledges that it still has plenty of work to do to achieve its vision of 100 per cent-certified sustainable palm oil in the market, but CSPO is certainly a growing player in the global market.

'While there is room for improvement within RSPO, achieving a sustainable oil palm industry is extremely complex with many competing issues. There is no "silver bullet" solution,' insists Jennifer Lucey, NERC Knowledge Exchange Fellow at the Department of Zoology at the University of Oxford, and programme manager for SEnSOR (Socially and Environmentally Sustainable Oil palm Research), a multi-disciplinary research programme designed to test the success (or otherwise) of the RSPO.

'In my personal opinion, huge progress has been made, and the RSPO is succeeding in driving behaviour change within the industry,' she continues. 'The process of multi-stakeholder cooperation to improve sustainability is the best way forward, even if the change is not as rapid as some might hope. Given the vital income that oil palm provides for developing countries, and the lack of more sustainable alternatives, my own consumer choice is to buy from brands and retailers with commitments to sourcing sustainable palm oil.'

Much of the effectiveness of the RSPO revolves around the installation and maintenance of High Conservation Value areas (HCVs), those larger, more highly biodiverse forest areas most valuable to preserving local flora and fauna.

'Our research in Borneo is indicating that some HCV areas within plantations are large enough to be able to support regenerating forest and a substantial component of forest biodiversity, but others are too small to support viable populations,' explains Lucey. 'Given this, HCV areas designated for conserving biodiversity in future plantation developments should be designed to be larger. Plans to increase forest protection through a "no deforestation" policy in the current review of the RSPO's Principles and Criteria, would protect more degraded forest that is not currently covered under "primary forest" or "HCV" criteria, this would substantially improve the impact of RSPO in conserving biodiversity.'

Lucey accepts that this is a complex issue, though, particularly in high forest cover areas where smallholders and even whole regions or countries could be excluded from participating in RSPO if the policy is 'not carefully thought out'.

Such an upgrading of RSPO regulations – to be decided next year – could have a significant, positive impact on the biodiversity of oil palm plantations. While the many smaller animals this would initially protect may not receive the publicity of the elephants, orang-utans, tigers, rhinos and other photogenic species threatened by rampant unregulated oil palm plantations, their survival is vital to creating the necessary habitats for the larger species.

'Invertebrates, plants, and other less charismatic species are essential for ecosystem health, and if these communities collapse there is no hope for larger species,' says Lucey. 'Many of these smaller species are likely to be much more sensitive to the environmental changes from land conversion than large mammals, but these less charismatic species often go unnoticed.'

As she points out, recent studies by the Borneo Futures initiative – providing accurate scientific information to protect the island's biodiversity, found that while deforestation in Borneo was substantially reduced in RSPO plantations compared to non-RSPO plantations, the decline in orang-utan populations was broadly the same, suggesting there are significant improvements still to be made in enabling these HCVs to create viable habitats for healthy populations of larger species. 'A key step that could benefit iconic conservation species, as well as a wider suite of threatened forest species,' Lucey adds, 'would be to improve forest connectivity in oil palm landscapes.'

FOREST CONNECTIONS

For even those environments that have already been wiped clear of the highly biodiverse forest which once covered the landscape, there is now a glimmer of hope that oil palm plantations might not need to be the sterile monocultures which they have predominantly become, that forest connectivity could be reintroduced in places where it has previously been wiped out. New research undertaken, also in Borneo, by researchers from the University of the West of England – funded by the RGS-IBG's Gilchrist Fieldwork Award to tropical ecologist Dr Farnon Ellwood and the Slawson Award to PhD student Josie Phillips – hints at one particular plant which might make all the difference. The bird's nest fern (*Asplenium nidus*) grows on trees in an epiphytic fashion (meaning it's dependent on it only for support, not for nutrients), and while it may be a common house plant in the UK, it is native to many tropical regions, where as a keystone species it performs a vital ecological role.

'I've worked on this plant for a few years, having shown originally that bird's nest ferns can house around half of the invertebrate biomass in Southeast Asian tropical forests,' states Ellwood. 'It just so happens that this plant, already widely used as a model system for understanding the nature of biodiversity, grows naturally in oil palm plantations. We are currently developing this idea about it actually being a reservoir of biodiversity among the oil palms, a little stepping-stone for small animals to be able to survive in an otherwise hostile habitat.'

The work of Ellwood's lab could potentially

Palm Oil Alternatives

■ The dream for many campaigners would be a alternative to palm oil, something which would push the product out of the market entirely. A certain kind of yeast is one such product, and is at the centre of a project at the University of Bath. 'We're not talking about *Saccharomyces cerevisiae*, not beer yeast, or yeast that you use to make bread,' points out Chris Chuck, a reader in chemical engineering at Bath. Instead, his team focuses on growing the yeast *Metschnikowia pulcherrima* on a variety of agricultural and food waste, and can be made to produce a thick oil that has remarkably similar properties to palm oil

As Chuck explains, the goal of a palm oil alternative such as this isn't to immediately replace the 60 million tonnes of palm oil that's produced annually. Instead, the aim would be to create a sustainable product which could go from the research lab all the way to industrial production, to try and limit

the need for new oil palm plantations. 'If we could get it into industrial production, we could demonstrate that it was an economic product that was also sustainable,' continues Chuck. 'In effect this would allow policy makers options for being able to phase out, or at least curb the growth of the sector. All our initial modelling of what it would cost, what the process would look like, has been very positive. So now it's about demonstrating it on a larger scale.'

Other ingenious alternatives include fungi, such as that being trialled by CarboCycle, a project at Columbia University; algae, where tests have produced algal oil derived from sugar cane, or illipe, a variety of 'butter' sourced from tengkawang nuts. But at present, these products – all marketed as ethical alternatives to palm oil – can at best fulfil a high-end niche, not as something which can be scaled up to economically compete globally without becoming as severe or worse of an environmental threat.



revolutionise how we think about oil palm and biodiversity. Instead of lifeless 'green deserts', as Ellwood describes them, reintroducing these ferns right into the heart of the oil palm could potentially provide a home for all manner of species, from microbes such as fungi and bacteria, to invertebrates such as insects, amphibians, reptiles and even mammals, as well as that vital connectivity between HCVs.

'Let's say for example that there are ten ferns in one hectare of oil palm, and that these ferns contain a thousand animals,' he continues. 'If we add another ten ferns, doubling the number, we would also double the number of animals. We call this a "meta community" – one big community made up of lots of little ones, like stepping stones. In this way we could increase biodiversity and improve sustainability within the plantations. It's certainly an argument that has won over the Eden Project, which is currently hosting an exhibit (and a range of accompanying experiments) in its tropical biome around the question of whether a humble epiphyte could be the saviour of biodiversity in Southeast Asia.'

As always, the success of this venture is wholly dependent on total buy-in from all interested parties, including growers of oil palm, producers of palm oil, retailers, and consumers. 'The drive for sustainability is there – and it's coming from within the industry as well – so in the next few years we should see big changes in the way plantations are managed, and the way oil is produced and distributed,' adds Phillips. 'It's important to know, however, that boycotting oil palm products will shift the problem elsewhere, vegetable oils are almost unavoidable in everyday life. It's much better to purchase RSPO-certified products as this will drive demand for sustainable products, increasing incentive to produce sustainably.'

CONSTRUCTIVE ENGAGEMENT

Every country has a different relationship with palm oil, with both positive and negative factors at play. Therefore, if nothing else, it appears dangerous to simplify such a multifaceted subject into such polarised silos as 'good' or 'bad'. Certainly casting palm oil, which Farnon Ellwood describes as a 'wonder crop', entirely as the villain, doesn't seem a very constructive way of dealing with the key issues, especially with the livelihoods of millions at stake.

Few people would want to see anything other than a radical reversal of the destruction seen across Indonesia and Malaysia, but unless you happen to believe we can wean ourselves off vegetable oils entirely – an extremely unlikely prospect, based on current consumption demands – then it primarily comes down to a choice between high-yield palm oil, or low-yield alternatives. The ability to enforce both existing and new plantations to supply the ever-growing demand for palm oil significantly more sustainably than in the past may be one of the most crucial questions for planetary biodiversity over the coming years. ●

■ For the WWF Palm Oil Buyers Scorecard, grading different retailers by their purchasing of certified sustainable palm oil, visit geog.gr/sustainable-palm.