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## Exploring lesser known tropical oils as substitutes for palm oil

**Info Briefing #3**  
**Prepared for Partnerships for Forests**  
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## UK Sustainable Palm Oil Initiative – Info Briefing #3

This Info Briefing is part of a series designed for the stakeholders of the UK Roundtable on Sourcing Sustainable Palm Oil (UK RSSPO) and wider partners to provide relevant information and updates on issues surrounding the sourcing of certified sustainable palm oil.

It is designed to complement our series of webinars on alternative oils to palm oil, which contain practical information on evaluating oils and fats and sourcing CSPO. It does not provide a full overview of all alternatives to palm oil and is not industry-tested; rather it explores some of the lesser known tropical oils and considers their viability as alternatives, using desk-based research only.

The UK Roundtable on Sourcing Sustainable Palm Oil (UK RSSPO) is part of the broader UK Sustainable Palm Oil Initiative, facilitated by Efeca and funded by the UK Government Department for International Development (DFID) via the Partnerships for Forest (P4F) programme technical assistance facility.

### Info Briefings

Please see below for a list of other Info Briefings.

Info Briefing #1: [Palm oil in the foodservice sector](#)

Info Briefing #2: [Palm oil in the oleochemical sector](#)

Info Briefing #3: Exploring lesser known tropical oils as substitutes for palm oil

Info Briefing #4: Changes to the Renewable Energy Directive: impacts on palm biodiesel

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## 1. Introduction

The public debate about the use of palm oil has been brought to the forefront of consumer attention in 2018 and 2019, in the wake of Greenpeace's orangutan advert and Selfridge's and Iceland's removal of palm oil from their own brand foods. As a result, many companies are evaluating whether palm oil can be sourced in a truly sustainable manner through certification, or whether palm oil should be substituted with other oils and fats. Iceland has decided to replace all palm oil used in their own brand mince pies, for example, with coconut oil.

Palm oil has become a ubiquitous and versatile ingredient because of the many practical characteristics useful to the food and oleochemical industries. Demand for the oil continues to grow, despite its sustainability concerns. These include environmental sustainability concerns around biodiversity loss due to deforestation, other land use changes (including conversion of peatland), water use, GHG emissions, fertilizer/inputs, monoculture farming degrading soils, and pollution from effluents, as well as social sustainability considerations around exploitation, legal rights, land rights and working conditions.

Although the supply chains for soya, rapeseed and sunflower are well developed, these oilseeds do not offer the same fatty acid profile as palm oil, meaning they have different physical characteristics and represent less suitable substitutes. Indeed, these three large-scale alternatives also have their own sustainability issues, which this info briefing does not consider.

There has been increasing interest in shea butter, coconut oil and other lesser known oil/seeds (such as the wild Indian crop 'sal',<sup>1</sup> assessed below) due to their similar fat content profiles to palm oil and palm kernel oil. This note begins to investigate the practicalities of replacing palm oil, with a focus on these lesser known, and less available, substitutes. We compare palm oil, coconut oil, shea butter and sal oil/butter in terms of industry development, supply metrics, with a particular focus on the environmental, social and economic sustainability risks.

## 2. Substituting palm oil with other tropical oils: substitutable characteristics

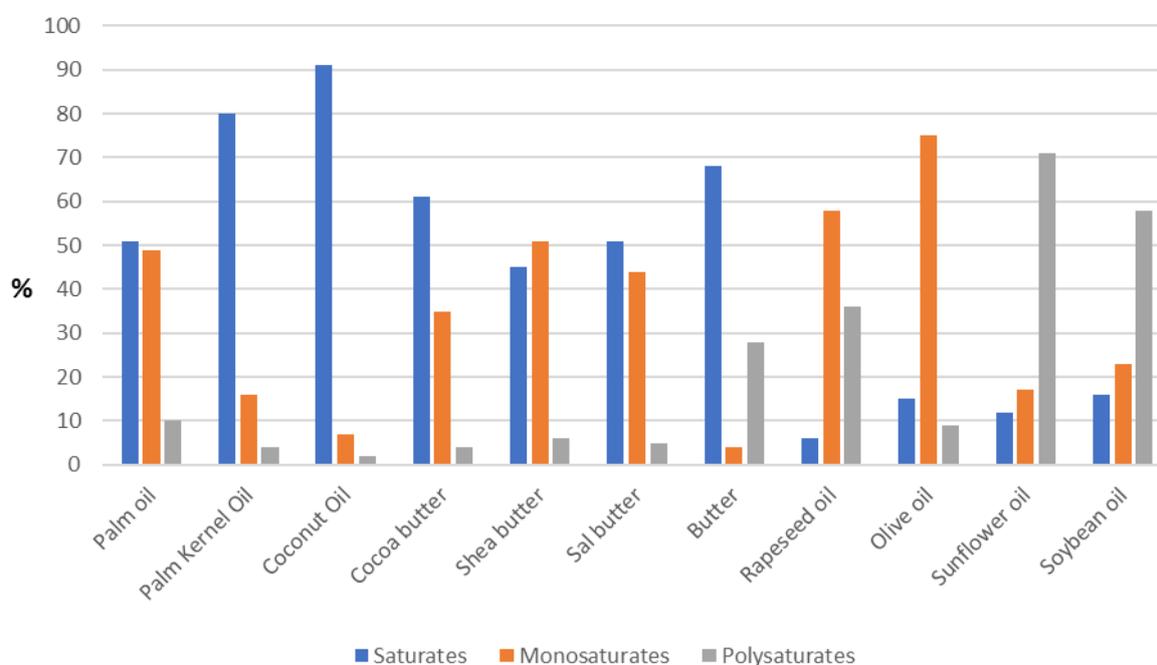
One of the first decisions in choosing an oil or fat will be whether it meets the needs of the application or use. Palm oil is used widely as an input into many food and oleochemical products for a variety of reasons, in particular:

- Flexible application/functionality – palm oil's balance of saturates and unsaturates in particular give palm oil uniquely useful characteristics including:
  - Both liquid and solid (especially at room temperature) properties
  - Organoleptic properties (neutral or positive taste and smell)
  - Good shelf life
  - Stability at all stages in the process through to consumption
  - Smooth, creamy texture, and minimal greasiness

<sup>1</sup> The sustainability issues and development of the industry for other wild seeds such as illipe, kokum and mango kernels, are fairly similar to that of sal seed.

- Good nutrition profile (good balance of fat content between saturates/unsaturates, and protein)
- Large availability and competitive price

So far no single substitute exists that can replace palm oil for all uses (food, cooking oil, oleochemicals, cosmetics, pharmaceuticals, biofuels), certainly at the scale that palm oil is produced at. However, as *figure 1* identifies, certain substitutes do closely resemble palm oil's fat profile, including shea butter and sal, whilst coconut closely resembles palm kernel oil. This would allow them in theory to be substituted for palm oil/palm kernel oil in products such as food (especially confectionary), and oleochemical products (soaps, moisturisers etc). For oil users less concerned about oil properties (e.g. for cooking oil, biofuel), widely available substitutes such as soya, rapeseed and sunflower may be a more practical and a potentially cheaper alternative.



*Figure 1* – Comparison of fat content of palm oil and popular substitutes

In recent years, there has been some increased investigation into and demand for coconut, shea and sal (and other wild oil seeds such as illipe, kokum and mango kernels). However, there is concern that demand is increasing without due attention to some of the sustainability concerns related to these oils. *Table 1* below begins to summarise and compare the characteristics and sustainability concerns of palm oil and substitutes shea, coconut and sal oil.

Table 1 – Comparison of the sustainability concerns associated with palm oil, coconut, shea and sal

Characteristics	Palm Oil	Coconut Oil	Shea	Sal
<b>Level of development of supply chain</b>	High yielding palm trees grown in plantations at range of scales: small scale farmers, government companies and at scale by large companies. Harvesting primarily by hand. Highly developed supply chain, large scale production. Industrial level production, certainly in top producing countries (Indonesia, Malaysia).	Coconut trees grown in plantations at range of scales: small scale farmers, to large scale companies. Harvesting by hand and with trained monkeys. Industrial level production and supply chains in top producing countries (Philippines, India, Indonesia).	Shea tree is wild and grows primarily in West Africa. It has been resistant to domestication so not grown in plantation. Harvesting tends to be done by women. Average of 3 million women earn a living from shea. <sup>2</sup> Supply chain beginning to establish. Growth held up because wild trees grown wild over very large area - difficult to get economies of scale, mechanise, or create efficiencies.	Sal tree is wild and found in forests across India. Estimates of 20-30 million forest dwellers earning a living from sal harvesting. Yields naturally fluctuate annually as trees recover. Quality also an issue due to different varieties of tree, and differing harvesting practices. Supply chain in infancy. Considerable barriers to overcome to commercialise.
<b>Environmental concerns</b>	Widely researched and monitored. Significant concern about land use conversion (deforestation) particularly in Indonesia and Papua New Guinea. Impacts on biodiversity, conversion of peatlands, GHG emissions, monoculture degrading land, pollution from effluents. Sustainability initiatives at global and local level, incl. RSPO, ISPO, MSPO, NDPEs.	Less widely researched. Concerns over deforestation to create plantations, but not on scale of palm oil. Monoculture potentially degrading land. No coconut specific sustainable certification schemes. Possible to purchase through fair trade and as organic, or under Rainforest Alliance.	Lack of publically available information. Because grown wild rather than in plantations, hard to monitor, but assumed lower impact. Harvesting and protection of wild trees may be protecting savanna habitats in some areas. Farmers have found benefits of protecting existing trees and growing crops around existing trees. Some cooperative initiatives are taking some account of environmental sustainability. Global Shea Alliance provides some sustainability coverage.	Lack of publically available info. Because grown wild, harder to monitor. Sustainability risks exist: some Indian states have banned collection to allow landscapes to regenerate – forest dwellers have been known to clear forest floor to make it easier to harvest – impacting on biodiversity. No sustainability schemes or cooperative initiatives to ensure environmental sustainability.
<b>Socio/Economic concerns</b>	Widely researched. Concerns about exploitation of farmers/workers and growers, around pay and conditions, around land/workers' rights. Some of these issues are addressed by multinationals including through RSPO. Regular reports of issues.	Lack of publically available info. Harvesters on lower incomes – concerns around exploitation and farmers receiving fair price for their produce. It is possible to purchase through a fair trade type scheme.	Reported concerns that harvesters/ collectors/ local processors are on very low incomes and not receiving fair share of the value of their produce. Gender issues exist – women do much of the collection/ harvesting/ processing but often lack bargaining power.	Harvesters/collectors/local processors on very low incomes. Market prices often set by local government in India – sometimes making a loss. In high-yield years, wages can be below survival level. Stabilising the price, quantity, quality through investment in sal industry may go some way to would need to address these concerns.

<sup>2</sup> <https://www.un.org/africarenewal/magazine/august-2013/shea-butter-nourishes-opportunities-african-women>

## 2.1. Comparing scale and yield

The biggest difference between these oils may be the scale of alternatives, in terms of volume produced and availability on the global market. Palm oil production volume is larger than all other oils in the world (72 MT in 2018<sup>3</sup>), and its supply chain and processing infrastructure are advanced and complex. It is also the highest yielding of oils, often producing ten times the yields of comparable oils. Furthermore, palm oil can be sourced as certified – about 19% of world production is RSPO certified, and certified sustainable palm oil is widely available in the UK.<sup>4</sup> Coconut, shea and sal industries currently operate at smaller scales, with much lower yields and less developed supply chains than palm.

### Coconut

- The Philippines, Indonesia and India are the largest producers of coconut oil, accounting for 70% of global production between them in 2014. World production of coconut oil reached more than 2.8 million tonnes in 2018.<sup>5</sup>
- The coconut industry is well established with refining capacity and well-developed supply chains. However, its flavour/taste, grainy nature, and difficulty for processing does limit its practical uses. Production is mostly focused in smallholder farms, which leads to reduced yield and efficiency. In 2012, world-wide, at least 10 million farmers and their families cultivated coconut palms on an estimated 12 million hectares. Tens of millions more own a few coconut palms, which contribute to their livelihoods.<sup>6</sup>

### Shea

- Shea is harvested from wild trees that grow sparsely across the savannahs of West Africa (see figure 2), and are subject to fluctuations in yield. National and international statistics on production and export are unreliable. Estimates of domestic consumption of shea nuts in Africa ranges from 50%-90% of total production. In the last decade, exports have ranged between 200,000 and 450,000 tonnes of shea per year. Furthermore, even high density production only yields <0.1 tonnes per hectare and 10kg fruit leads to about 1kg of fat.
- In recent years, an industry has developed around shea, but it is still in its infancy, lacking investments and economies of scale. Shea trees are hardy, but to date they have not been successfully grown in plantations at significant scale, limiting the ability to expand production. Variation in quality can be a concern,<sup>7</sup> but there are now several West African refining operations for securing product at required specifications, albeit smaller scale. To meet the demands of international buyers, however, shea butter needs to conform to stringent purity and consumer safety standards. Shea can be substituted for cocoa in confectionary manufacture, and has been recognized as an equivalent by the EU (up to 5% allowed as cocoa butter equivalent) and India. As a result, demand is influenced by cocoa availability and price. Both the seed kernels and the butter are shipped to Europe, Japan, the United States and South East Asia, for processing and retail. Nevertheless, reliability of supply remains a large concern.

<sup>3</sup> Oil World, 2018.

<sup>4</sup> UK Round Table on Sustainable Palm Oil Annual Progress Report suggests over 77% of UK palm oil has been certified in 2018

<sup>5</sup> Oil World, 2018.

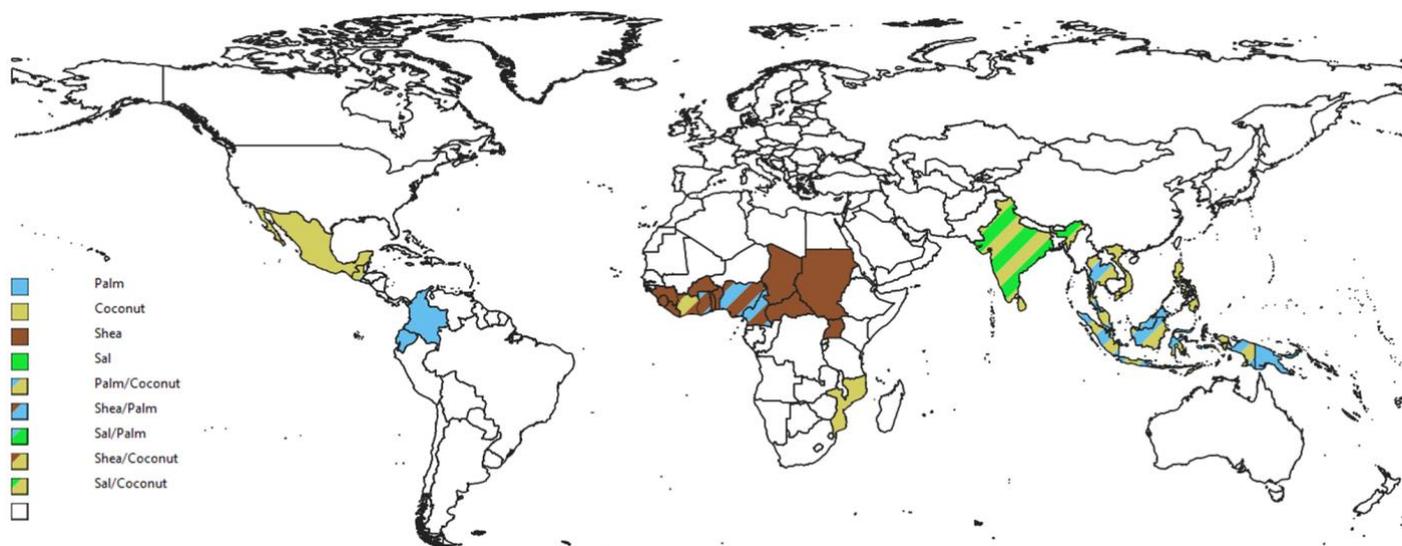
<sup>6</sup> <http://business.time.com/2012/12/05/why-the-coconut-craze-isnt-helping-farmers/>

<sup>7</sup> <http://www.intracen.org/news/Improved-quality-leads-to-exports-for-Nigerian-shea-butter/>

## Sal

- Sal grows wild in dense, primarily Indian forests (*see figure 2*), is subject to annual yield fluctuations, and is collected by hand by forest dwellers. There are no reliable figures on production or export, with most sal oil believed to be used domestically. Again, even high density collection only yields <0.2 tonnes per hectare and 3-4 kg of seeds leads to about 1kg of oil.
- A formal farming economy is yet to take off. Similar to shea, there are issues with uniformity of quality and natural annual yield fluctuations that will continue to hold back its development. Harvests have inconsistent fat levels (and so don't have the right quality for certain food or oleochemical uses). The lack of regulation, or systemized monitoring, of sal oil has meant the produce often fails to meet European and Japanese laws on pesticide use – with importers preferring other fats able to meet high quality specifications.<sup>8</sup> There are issues of hygiene, toxicity, and taste reported as well. Although Sal seed finds uses in food processing industries in India, domestic food laws remain a huge bottleneck in further diversification of the uses of Sal seed. Domestic legislations like the Prevention of Food Adulteration (PFA) Rules 1954 prohibit use of Sal fat in a number of prospective industries like chocolates, ice creams, etc.

*Figure 2* – Location of key producer countries of palm, coconut, shea and sal  
(Top ten coconut/palm, FAO 2016)



## 2.2. Considering environmental sustainability

As noted above, palm oil comes with well documented sustainability concerns, although the industry is beginning to take measures to address and mitigate these. There is though limited research available assessing the sustainability concerns of coconut, shea and sal productions. Should production of these alternatives increase, then sustainability issues may arise. Some of the key issues are described below.

### Coconut

- Large scale coconut plantations share some of the same environmental impacts as palm oil, due to mono-cropping and use of pesticides. The overall global impact is much lower,

<sup>8</sup> <https://phys.org/news/2015-10-resource-potential-sal-seeds-india.html#jCp>

however, as total production is lower and a higher proportion is produced by smallholders through traditional means. Coconut plantations, often grown on sandier land types which are unsuitable for many other productive uses, are unlikely to have the same deforestation and emission concerns. In addition, the value of the coconut oil market is as yet insufficient to drive significant deforestation.<sup>9</sup> Some coconut plantations have been planted on deforested tropical peatlands in Malaysia. Expansion of coconut production is possible, but efforts will need to be made to ensure these do not lead to deforestation. A coconut specific sustainable certification scheme does not currently exist, but it is possible to purchase organic or fair trade oil.

#### Shea

- In their infancy as a commercially harvested crop, the environmental impact of shea and sal have not been widely researched. Whilst there are good news stories about how farmers are developing agro-forestry systems by growing other crops around protected wild shea trees, the environmental impact of shea harvesting is currently unknown. Although shea trees are often protected by farmers, there are concerns that farming is expanding and clearing other native plants around existing trees, with possible biodiversity, water and emission concerns. No significant sustainability or organic growth scheme currently exists at any significant scale, although some individual traders have set up their own initiatives and sustainable procurement policies. with varying focus and methodological integrity. The inability to plant shea trees successfully may also prevent the sustainability concerns associated with industrial levels of production.

#### Sal

- Sal trees also grow wild, but there are more reported concerns of native inhabitants clearing the understory of large forested areas in order to improve harvesting, causing lasting biodiversity and deforestation concerns. Some regions have banned harvesting to allow forests to recover. No significant sustainability or organic growth scheme currently exists at any significant scale.

### 2.3. Considering social sustainability

As for environmental issues, social concerns about palm oil practices are widely researched and reported, including concerns about exploitation of farmers/workers and growers, pay and conditions, and land/workers' rights. The issues encompass how these crops are grown and include whether the rewards/value of the crop are equitably shared with workers in the supply chain, whether wages and production systems allow for impoverished communities to develop, and whether production impacts on people living locally. In some instances, the RSPO and large multinational companies are now beginning to enforce certain minimum wage and working standards. Many of these social issues are also applicable to coconut, shea and sal, which are also grown in countries with often weakly enforced governance, but to a lesser degree. Undoubtedly, there are benefits from the employment, revenue and foreign exchange that the crops can offer.

#### Coconut

- Because coconut trees can grow on land which is otherwise unproductive and can be grown as an intercrop, smallholders certainly benefit from the incomes. However,

<sup>9</sup> <http://www.ethicalconsumer.org/ethicalreports/palmoilreport/coconutoil.aspx>

coconut farming may not always provide a sufficient living for smallholders. Many coconut growers across Asia sell their product at low prices to middlemen, who then resell the coconuts to factories for as much as 50% more.<sup>10</sup> This is where processing for higher value products such as coconut water or oil occur. Recent increases in the popularity and price of coconut oil and coconut water have yet to translate into higher prices for farmers due both to fluctuations in local supplies. Smallholder coconut farmers face significant challenges that make them among the least resilient to environmental and economic shocks, including natural disasters, global market volatility and crop failure. For larger scale plantations, some claims around exploitation of workers exist, or of farmers not receiving fair price for their produce. There may be issues around the safety in harvesting techniques, including climbing, as well as the abuse of monkeys for harvesting. It is possible to purchase coconut through fair trade schemes, mitigating some of these concerns.

#### Shea

- There is much less research on the social impacts of shea. The clearest concern relates to the exploitation and unequal treatment of women who tend to harvest the shea crop. Many small-scale schemes and cooperatives have been set up, with many traders and retailers creating initiatives to support and empower women in the supply chain.

#### Sal

- Very limited research exists on social impacts of sal harvesting and processing. Sal seeds are harvested and collected by forest dwellers primarily. But because of the huge natural fluctuations in supply, prices of sal are often very low. Market prices are often set by local government in India – with some regions experiencing losses in glut years. Without investment, it may not be possible to stabilise the price, quantity or quality of the crop, or to satisfactorily address the wider sustainability concerns.

### **3. Alternatives are an opportunity, but currently unlikely to be used as large scale substitutes**

Overall, at this current time, there is no single alternative to palm oil. No single crop can replace it for its versatility, its scale of production, or its high yields – it is a very efficient way to meet the growing global demand for oils from the food and oleochemical industries. Indeed, while efforts have been made (e.g. with RSPO developments) it is widely recognised that more can be done to address the sustainability of palm oil.

Coconut, shea and sal do offer some diversity of choice and flavour, and they can provide a point of differentiation at bespoke levels. However, they may not currently be able to replace palm oil supply at scale, and also present their own environmental and social issues. Without further investment and development to the supply chain, it will be challenging for these oils to represent viable substitutes to palm oil at scale.

<sup>10</sup> <http://business.time.com/2012/12/05/why-the-coconut-craze-isnt-helping-farmers/>