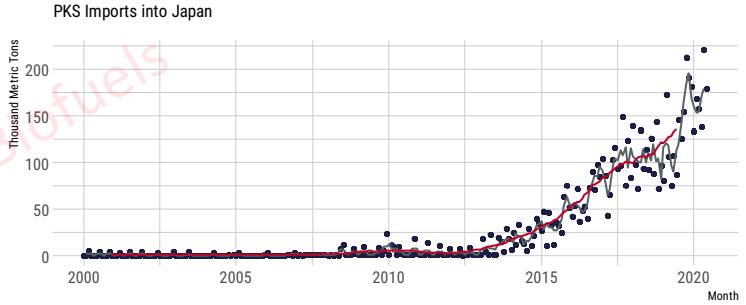
Palm Kernel Shells

Context as a Biofuel

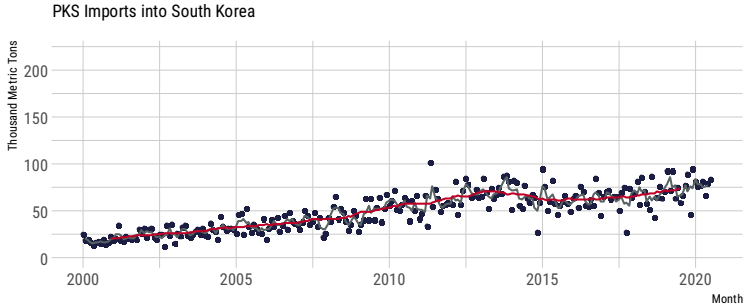
03 – 09 – 2020

Imports of Palm Kernel Shells into East Asian countries continue to rise

- There is large and growing demand for sustainable biomass in Asia and palm kernel shells have become a significant fuel input, especially in Japan and South Korea.
- Growth in Japan has been particularly strong since the introduction of the Feed-in-Tariff scheme in July 2012, while South Korean utilities started procuring PKS earlier and imports have seen a more linear growth.



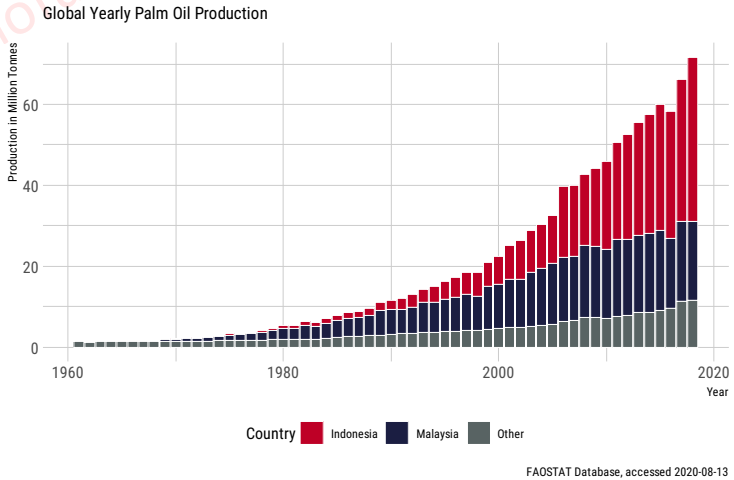
Ministry of Finance: Trade Statistics of Japan, Accessed 21.08.2020



Korean Customs Service, Accessed 17.08.2020

Available quantity of PKS keeps growing with the production of Palm Oil

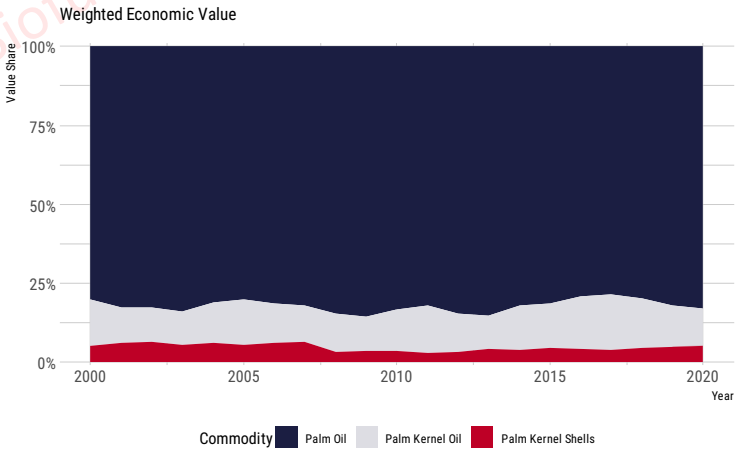
- As a residual product of the palm oil and palm kernel oil production process, PKS is available in large amounts, as production of palm oil continues to increase, especially in Indonesia and Malaysia.
- Shells usually account for about 7 % of the total mass of a fresh fruit bunch.
- While there are valuable applications for other residual outputs, such as empty fruit bunches (field covering) or palm kernel meal (additive for animal feed), the shells are usually used for on-site energy generation and the excess material is used as filling material for construction projects. If there is no application for excess shells, they are commonly disposed and left to rot.



FAOSTAT Database, accessed 2020-08-13

The low economic value of the shells compared to other outputs makes a significant effect on the extend of palm plantation activities unlikely

- As there is no other economically viable uses for excess palm kernel shells than energy generation, their economic value is relatively low. The figure on the right shows the share of value attributed to palm oil, palm kernel oil and shells under consideration of their respective mass per fresh fruit bunch.
- Even without consideration of other process outputs, such as palm kernel meal, empty fruit bunches or press fiber, PKS only stands for about 5% of the value per fresh fruit bunch.
- The share has not changed with demand for PKS rising, further indicating that there is no scarcity in supply and it its use as biofuel provides an opportunity to efficiently use excess biomaterial.
- PKS' effect on palm plantations and deforestation should be considered but its low economic value makes it unlikely that increased demand will lead to an expansion of plantations.



Ministry of Finance: Trade Statistics of Japan, Accessed 21.08.2020

Palm Kernel Shells are an alternative to Fossil Fuels for baseload capacity generation

- Palm Kernel Shells are an attractive fuel for power generation, as they are available in large quantities throughout the year, require no processing and are very easy to handle and transport in bulk.
- In countries' energy transition, palm kernel shells are thus an easy to procure input for thermal power plants to provide baseload capacity and can reduce the dependence on fossil fuels.

Fuel	LHV, Dry (MJ/kg)	Moisture (%)	Bulk Density, Dry (kg/m³)	Ash (%)
PKS	17.3	10	467	03 – 06
Wood Pellets	19.0	10	650	
Wood Chips	19.0	30	155	
Coal	26.5			
Natural Gas	49.2			

Sources: JRC, 2017 and BioGrace-II GHG calculation tool

Emissions in electricity generation can be significantly reduced by switching from Fossil Fuels to PKS

- For biomaterials classified as residues or waste, the emissions are usually calculated from collection at the respective origin. As PKS does not require processing, the main driver of its emissions is transport and distribution.
- Using the EU fossil fuel comparator, a reduction of emissions by around 85% can easily be achieved.
- The reduction potential varies by country depending on the availability of local resources and the energy mix.

Assuming 150 km land transport on a 20-ton truck and 5,000 km shipping on a handysize bulk carrier, transport emissions are:
7.22 g $CO_{2\ eq}$/MJ

Fuel in use emissions of N_2O and CH_4 are:
1.52 g $CO_{2\ eq}$/MJ

At 30% boiler conversion efficiency this totals:
29.07 g $CO_{2\ eq}$/$MJ_{electricity}$

Compared to the EU 2030 scenario fossil fuel comparator of 183 g $CO_{2\ eq}$/$MJ_{electricity}$, the emissions would be reduced by around **84%**.

”Wastes and residues, including tree tops and branches, straw, husks, cobs and nut shells, and residues from processing, including crude glycerine (glycerine that is not refined) and bagasse, shall be considered to have zero life-cycle greenhouse gas emissions up to the process of collection of those materials irrespectively of whether they are processed to interim products before being transformed into the final product.”
Directive (EU) 2018/2001, Annex V, Part C, Paragraph 18

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