



**Water-logged:** The nature of mangrove swamps makes them unsuitable for oil palm cultivation, because its high water table would kill the crop.

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LOCAL palm oil producers and soil scientists disagree with the findings of a recent study done by researchers from the National University of Singapore (NUS), which claims that oil palm plantations is a major driver of mangrove deforestation in South-East Asia from 2000 to 2012.

The study, *Rates and drivers of mangrove deforestation in South-East Asia, 2000-2012*, by Daniel R. Richards and Daniel Friess from the department of geography, finds oil palm expansion to be "a key but unrecognised threat in Malaysia and Indonesia", contributing about 16% of the total area of mangrove deforestation during the study period.

Local palm oil producers, however, stress that their industry is not a threat to mangroves as they fully recognise the importance of the mangrove ecosystem.

According to them, the nature of mangrove swamps makes them unsuitable for cultivation of the oil palm crop.

"It is not economically viable to convert mangrove forest into oil palm plantations," says palm oil industry expert M.R. Chandran.

"Mangroves, by nature, have a very high water table. And that would kill the oil palms. To plant them there, you would have to drain the soil. And you can't do that because mangroves are at sea level.

"You have to remember that when you plant oil palms, you have them there for 25 years. And to cultivate oil palms in a mangrove environment over all that time does not make economic sense. One will have to spend a fortune building a bund to keep out salt water. It would be very costly."

The study, published in December in the *Proceedings of the National Academy of Sciences*, relates that the researchers used Google Earth to monitor how land was used once mangrove forests had been felled. Their analysis was also built on two existing datasets: *High resolution global maps of 21st century forest cover change* by M.C. Hansen (which maps global deforestation annually between 2000 and 2012 at a detailed spatial resolution), and *Distribution and dynamics of mangrove forests in*

# Main threats to mangroves

Mangrove loss driven by aquaculture and rice farming, not oil palm.

*South-East Asia* by Chandra Giri.

According to their research, mangrove forests were lost at an average rate of 0.18% per year in South-East Asia. While this is lower than previously published estimates (assumed to be at least 1% annually), it is still a cause for concern as it means over 100,000ha of mangroves were removed during the study period of 2000 to 2012 (9,535ha per year on average).

While the study names aquaculture and rice farming as the main drivers of mangrove loss (amounting to 30% and 22% of the total area lost respectively), it also points out oil palm plantations as a contributor, responsible for 16% of the deforestation area.

## Unrecorded reforestation

The study concedes that there has only been a limited number of local or anecdotal case studies identifying oil palm cultivation as a potential driver of mangrove loss. This, Richards and Friess state, could be due to unnoticed or unreported land conversion.

They note that in 2012, considerable deforested areas were classified as mangrove, particularly in Malaysia and Indonesia. As their study focused on deforested areas, it did not record mangrove reforestation.

"It is likely that mangrove forest has been established in areas where it was not present in 2000, but such expansions would not be recorded using our method. The rate of mangrove forest conversion is considerable in South Asia, so it is possible that the percentage net loss in mangrove forest areas in South-East Asia between 2000 and 2012 may be less than 2%," the study states.

According to Richards, their study finds that 38% of the mangrove forest lost in Malaysia between 2000 and 2012 were converted to oil palm plantations, many of which in Sabah and Sarawak.

"We understand that palm oil is a useful commodity, and oil palm agriculture is an important industry in South-East Asia. By quantifying the relative importance of the different processes driving mangrove change, we hope to stimulate discussions about the best ways to sustainably produce products such as palm oil, and the need to conserve mangroves," Richards says via e-mail.

He says comparison of satellite imagery shows conversion happening in two ways. Firstly, the landward edge of the mangrove forest is dyked to disconnect it from the sea, and then drained.

Alternatively, mangroves may be converted to aquaculture, which is subsequently converted to oil palm.

"We are very keen to work with oil palm companies to understand the challenges of establishing plantations on mangrove areas and the reasons for doing so," says Richards, now with the department of animal and plant sciences at the University of Sheffield, England.

## Unsuitable terrain

Chandran says oil palm growers rarely convert mangroves into plantations as there are laws in place to prevent this, and mangroves could not be developed without government approval. He believes that the mangrove forests which have been converted were probably the work of illegal timber companies.

Forest management specialist Dr Shamsudin Ibrahim too, does not view oil palm plantations as a major threat to mangrove forests at this time. He says greater threats exist in the form of land reclamation projects, which see mangrove areas being repurposed for housing, industrial or aquaculture purposes.

"The conditions of the (mangrove) ecosystem are not suitable. The soil in mangrove forests are usually very anaerobic. The plants there thrive in conditions with low

oxygen. However, when you raise the soil for agricultural purposes, it becomes oxygenated, and therefore, becomes acidic. This makes it difficult to plant crops there," says Shamsudin, who lectures at the Faculty of Forestry in Universiti Putra Malaysia.

Soil scientist Dr S. Paramanathan says that mangrove areas may be a difficult environment, but it is possible to change them into oil palm plantations, citing Pulau Carey in Selangor as an example. However, this involves a lot of time and expense.

"To build a bund, you will need to bring in soil from a hill or such, which will bring up costs. Smallholders wouldn't be able to do it. A big company could, but if they have land elsewhere, I would advise them to go there instead," Paramanathan says.

"Every year when there is a neap (very high) tide, the possibility of the bund breaking is very high. Crabs, which live in mangroves, can also make nests or burrow holes in the bund. The tide comes in and you will have to wait for rainwater to wash away the salt water."

## Valuable ecosystem

United Plantations Bhd vice-chairman and chief executive director Datuk Carl Bek-Nielsen stresses that the palm oil industry is aware of the importance of mangrove conservation.

"It is wrong to convert any mangrove areas into any kind of agriculture. They should be protected and maintained, because they are a natural barrier and a vital ecosystem."

"Mangroves act as kidneys, cleansing and purifying all the waste and seawater, thus maintaining the bio-ecosystem services which are vital for sustaining spawning grounds for river and marine life."

"So I do not think it is prudent or a rational thing to develop man-

groves, as these areas normally possess marginal soils, which will provide substandard agricultural yields. They are therefore not worth the extra effort when put in perspective to the undermined eco-services which mangroves provide."

Bek-Nielsen says he does not have statistics on whether mangroves were being converted into oil palm plantations. He says, however, that conversion of mangroves to plantations is not in line with the laws of the country, which require producers to maintain riparian corridors.

He stresses that the palm oil industry has committed itself to sustainable growth, and its expansion is always conducted in a responsible manner, especially if plantations are members of the Roundtable for Sustainable Palm Oil.

"In agriculture, no matter what you plant, you require land. If you check the Food and Agriculture Organisation statistics, you will see that 13.7 million hectares of forests worldwide are subject to deforestation every year. Over the past 20 years, over 230 million hectares of forest worldwide were cleared. Over the past 150 years, over 18 million hectares of land worldwide have been planted with oil palm. It's a very small percentage compared to what has taken place."

In comparison, he adds, 14 million hectares of soybean were planted in Argentina and Brazil over the past 10 years alone.

"The palm oil footprint in terms of global agriculture is very small, yet we have to act and behave responsibly, trying to embrace even more sustainable practices."

"Today the palm oil industry worldwide takes up only 0.4% of the world's total agriculture area, which includes farmland and pasture for animal husbandry. But in return, it produces 33% of the world's total oils and fats. We must always put things in perspective," Bek-Nielsen says.