When grown right, palm oil can be sustainable

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Juan Carlos Quezada working in an oil palm plantation in Colombia. Credit: © EPFL/WSL

Turning an abandoned pasture into a palm tree plantation can be carbon neutral, according to a new study by EPFL and the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL). These findings, based on measurements of 56-year-old palm tree plantations in Colombia, suggest we may be able to find sustainable alternatives to deforestation for the production of palm oil—a practice currently under fire by environmentalists.

Scientists from EPFL and WSL have been studying soils in oil palm cultivation for years, in an effort to develop more sustainable methods for growing this crop. Palm oil production has been criticized by environmentalists because of its large carbon footprint and negative impact on biodiversity. For instance, in Indonesia and Malaysia—the world's two biggest producers—it has directly or indirectly caused large-scale deforestation, thereby reducing biodiversity and releasing significant amounts of CO_2 into the atmosphere. And planting oil palm trees in the deforested areas does not make up for the lost carbon storage capacity, according to a 2018 study carried out by EPFL and WSL.

But the findings of a new study by EPFL and WSL—appearing today in *Science Advances*—indicate there may be a carbon-friendly alternative to deforestation. The scientists investigated oil palm crops that had been planted on former pastures in the Los Llanos region of Colombia, the world's fourth-largest palm oil producer. There, large areas of pastures—which themselves had been planted in the past on savannas—were replaced by oil palm plantations 56 years ago. By calculating the crops' carbon footprint since then, the scientists found that the total carbon storage—taking into account both vegetation and soil stocks—was unchanged relative to when the land had been used for pastures.

"Our study is the first to look at the carbon footprint of palm oil production over the long term—that is, across two plantation cycles,

since oil palm trees are replaced every 25-30 years," says Juan Carlos Quezada, a Ph.D. student at EPFL's Ecological Systems Laboratory (ECOS) and the study's lead author. "It's also the first to explore how converting pastures into oil palm farms affects soil quality and fertility over the long term, looking at all soil layers, not just the surface."

Carbon capture

In tropical climates, pastures—especially those that have been neglected and degraded—commonly consist of large grassy areas with a few small trees scattered around. Planting dense populations of oil palm trees—which can reach 15 meters in height—on these pastures can increase the carbon capture rate per unit of surface area, thanks to the palm trees' roots, trunks and leaves, as well as the vegetation around them.

Under typical farming methods, oil palm trees are cut down every 25-30 years and replaced with young trees to start a new plantation cycle. As the roots and other parts of the old trees decompose, they nourish the soil and partially offset the carbon initially lost in the upper soil layer when the pastureland was converted. As a result, over the long term cultivation period, the amount of carbon stored in the ecosystem remains unchanged compared to the initial level before land conversion took place.

An alternative worth exploring

"We should bear in mind that palm oil in and of itself is not harmful—neither to our health, when eaten in moderation, nor to the economy. And we're not talking just about multinationals—the incomes of hundreds of small farmers in Colombia and other countries depend on it," says Alexandre Buttler, head of ECOS and a co-author of the study.

"The problem lies with the negative carbon impact and loss of biodiversity caused by deforestation. But the main palm oil producing countries have large abandoned pastures that could be converted favorably, thus limiting the massive carbon loss resulting from deforestation."

This study was conducted as part of the Oil Palm Adaptive Landscapes (OPAL) project, a cross-disciplinary initiative funded by the Swiss National Science Foundation and led by ETH Zurich. OPAL brings together project partners from Switzerland, Indonesia, Colombia and Cameroon. Local universities, research institutes and the WWF in the latter three countries have a stake in the project, raising awareness about this issue among their local communities in order to promote the development of sustainable alternatives.

More information: J.C. Quezada Rivera el al., "Carbon neutral expansion of oil palm plantations in the Neotropics," *Science Advances* (2019). advances.sciencemag.org/content/5/11/eaaw4418 , DOI: 10.1126/sciadv.aaw4418

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