

Food, feed and fuel: Assessing and comparing global environmental impacts of different vegetable oils

Topic: Land-use change and agriculture

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Globally, vegetable oil and especially palm oil consumption has tremendously increased over the past decades due to their high versatility. Apart from being an input for food and feed, cosmetics and other consumer goods, vegetable oils, and especially palm oil, are frequently used as used as a renewable energy carrier [1]. Major energy scenarios expect a further surge of energetic biomass use [2]. While many countries put climate policies into place that promote substituting fossil fuels with low-carbon bioenergy, adverse environmental impacts especially due to land-use and land-use change have raised growing concerns [3]. Since a large share of global vegetable oil production is traded internationally, energy and/or environmental policies, changes in technology and consumption pattern can cause negative environmental impacts virtually everywhere in the world.

We quantify environmental impacts of vegetable oil consumption using a hybrid version of multiregional input-output model EXIOBASE for tracing the direct and indirect effects of the changes through the global production network. In this database, the aggregate agriculture and food sectors are replaced with highly detailed FAO data on the production, trade and consumption of the most important oil crops and vegetable oils in physical units. The integration of these data is carried out using a maximum entropy approach, which allows for the simultaneous estimation of unobserved commodity flows, as well as corresponding prices. Thus, possibly conflicting data constraints in various units of measurement, levels of aggregation and mismatching classifications are simultaneously satisfied.

For the results, we analyze the trade-offs and synergies between different environmental impacts, in particular land-use, land-use change, and related biodiversity losses, as well as GHG emissions by country/world region. By looking at both, the consumption and production side, we can identify spillovers of technological change, intermediate and final consumption on the major supplying countries of oil crops. The results show a shift of the environmental pressures across countries and differences in the total environmental pressures, depending on the oil used.

[1] Dings, J. (2016) Cars and trucks burn almost half of palm oil used in Europe, Transport & Environment.

[2] IEA Energy Technology Perspectives 2015, OECD Publishing, Paris.

[3] Gilbert N (2012) Palm-oil boom raises conservation concerns. Nature 487: 14-15.