

Abstract: The potential of climate-friendly fuels from natural oils

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The global energy transition faces a double challenge: while renewable energies are increasingly replacing fossil fuels in the electricity sector, a complete switch to electric drives in the transport sector is not realistic in the foreseeable future. Aircraft, ships and heavy commercial vehicles in particular will continue to rely on combustion engines for the decades to come.

In order to achieve climate targets nonetheless, climate-friendly alternatives to diesel, petrol and kerosene are needed that can be implemented quickly to restrict CO₂ emissions on an economically viable basis.

One promising approach is the use of non-edible oils – vegetable oils that are not suitable for food or feed production. Plants such as jatropha, pongamia, castor bean and neem thrive on barren, degraded land that is unsuitable for conventional agriculture. This eliminates the conflict between food and fuel, while at the same time creating new opportunities for sustainable land use. Reforestation of such areas also contributes to permanent CO₂ sequestration, the revitalisation of impoverished or eroded soils and the fight against advancing desertification – a multiple climate benefit.

Technologically, there are two main methods to process these oils, both readily feasible on an industrial scale:

- transesterification to biodiesel (FAME),
- hydroprocessing to HVO diesel and HEFA kerosene, which are chemically very similar to fossil fuels and can be handled in the existing refinery and petrol station infrastructure.

HEFA kerosene is considered a key option for sustainable aviation fuels (SAF). The EU wants to increase the share of SAF to 70% by 2050.

If jatropha oil capacities alone were consistently expanded, more than a quarter of global diesel demand and almost all kerosene demand could be covered.

There are also economic opportunities: although production costs are currently still higher than for fossil fuels, economies of scale, more efficient breeding and cultivation methods, CO₂ pricing and international partnerships can improve competitiveness.

In developing and emerging countries in particular, the cultivation of oil crops on unused land could achieve a triple benefit: climate protection through climate-neutral fuels, CO₂ sequestration through reforestation, economic development through export revenues and employment effects through labour-intensive agriculture.

The political course set is crucial. While the EU and the US are stimulating the market for advanced biofuels with blending quotas, tax breaks and subsidy programmes, the key question remains whether international climate partnerships could also promote the cultivation of non-edible oil crops. Only through cooperation between industrialised and developing countries can the potential be realised without creating new injustices.

Conclusion: Biogenic fuels from non-edible oils are not a niche solution, but could become a key pillar of the global energy transition. They offer the opportunity to make existing combustion technologies more climate-friendly, create CO₂ sinks, utilise degraded land and promote sustainable development in the Global South – a pragmatic and immediately effective contribution to achieving climate targets.