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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 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 and on an economically viable basis.

One promising approach is the use of so-called *non-edible oils* – vegetable oils that are not suitable for food production. Plants such as **jatropha, pongamia, castor or the neem tree** thrive on barren, degraded land that is unsuitable for conventional agriculture. This eliminates the "plate or tank" conflict and at the same time creates new opportunities for sustainable land use. Reforestation of such areas also contributes to permanent CO_2 sequestration, the revitalisation of impoverished or eroded soils and the fight against advancing desertification – a multiple climate benefit.

Technologically, there are two main methods used on an industrial scale:

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

HVO/HEFA 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 the entire 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, CO_2 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, CO_2 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 USA are stimulating the market for advanced biofuels with blending quotas, tax breaks and support 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 CO_2 sinks, utilise degraded land and promote sustainable development in the Global South – a pragmatic and immediately effective contribution to achieving climate targets.