Deutsche Umwelthilfe

Case study Germany:
More than 1 million hectares wasted

The huge climate costs of crop biofuels

Summary

For over 15 years, biofuels made from food and feed crops such as rapeseed, cereals and oil palm have been blended with fossil diesel and petrol in Europe. These crop biofuels currently account for the largest share of non-fossil energy in transport.

Crop biofuels are touted as a way to reduce CO_2 emissions from road transport and protect the climate. But they cannot keep this promise. The cultivation of the crops requires immense areas of land and is associated with huge climate costs – because natural vegetation could in principle grow on the land occupied by the crops and sequester carbon instead. **A new study commissioned by Environmental Action Germany (DUH) calculates for the first time these so-called carbon opportunity costs for crop biofuels produced and consumed in Germany.** Germany serves as a case study but the results and conclusions are transferable and relevant to the crop biofuel debate across Europe and beyond.

More than 1.2 million hectares - almost five times the size of Luxembourg - are used in Germany and around the globe to produce crop biofuels for consumption in Germany. On an area this size, regrowing natural vegetation could sequester 16.4 million tonnes of CO_2 per year on average. In contrast, the use of crop biofuels in Germany saved a maximum of 9.2 million tonnes of CO_{2eq} in 2020 according to official figures. **This shows: the use of crop biofuels does not benefit the climate, but harms it.**

The use of valuable land for crop biofuels is a poor choice not only from a climate perspective; the intensive agriculture also harms ecosystems and biodiversity. Large-scale nature restoration is urgently needed to help halt the ongoing loss of species and meet the German and European nature conservation targets.

Renewable energy for road vehicles can be produced without wasting huge areas of land: generating solar electricity for electric vehicles requires 97% less land than crop biofuel for the same mileage.

The study shows that a complete phase-out of crop biofuels can significantly reduce overall pressure on land, creating much-needed opportunities for returning suitable land to nature.

Policy recommendations

» **Crop biofuels should no longer count towards the renewable energy targets for transport under the EU Renewable Energy Directive (RED).** The EU Parliament and Council must push for this as part of the ongoing RED revision. Member States can also immediately phase out crop biofuels at national level – there are no obstacles under European law.

» **With the phase-out of crop biofuels reducing the pressure on land, more suitable land should be made available for nature restoration. Fertile farmland should be prioritised for food production.** Large, contiguous areas and/or areas with a particularly large carbon storage potential (e.g. drained peatlands) are particularly suitable for restoration. DUH does *not* advocate using the specific biofuel croplands for nature restoration.

» **From 2030 at the latest, no new cars with internal combustion engines should be registered in the EU.** Neither crop biofuels nor other so-called "alternative" fuels can make the combustion engine climate-friendly. In addition to reducing transport volumes overall and shifting to active and public transport modes, a switch to efficient electric powertrains and renewable electricity is necessary.

» **More ambitious mandatory reduction targets before 2026 are needed for the land use sector. Accounting for carbon sinks must be kept strictly separately and must not weaken emission reduction efforts in other sectors or even countries.** This is a vital aspect for the current revision of the EU LULUCF Regulation.

» **The upcoming EU nature restoration law should include ambitious, measurable targets and a clear time frame.** The Commission's legislative proposal, expected in March 2022, should include a binding target for restoring at least 15% of the EU's land area, sea area and river length by 2030.

1. The EU counts crop biofuels as climate-friendly – but the accounting has a major blind spot

Crop-based biofuels have been blended with fossil diesel and petrol in Europe for more than 15 years. The driver behind biofuel use in the EU is the Renewable Energy Directive (RED), which sets binding targets for Member States for the use of renewable energy in transport. So far, the targets are being met primarily through the use of crop biofuels, produced from plants such as rapeseed, cereals or oil palms. Large areas of agricultural land are occupied for cultivating these crops. In the case of Germany, crops for biofuels are both grown domestically and imported from other countries around the globe.

The EU considers the use of crop biofuels a contribution to reducing CO_2 emissions from transport, because the blending reduces the use of fossil fuel. However, the expansion of agricultural land for crop biofuels indirectly fuels global land conversion due to competition with food production, contributing to the destruc-

tion of carbon- and species-rich forests and peatlands – with devastating impacts on climate and biodiversity.

This has recently prompted the EU to introduce regulations to curb further expansion of agricultural land for crop biofuels. Yet even if these restrictions work as intended, the negative impacts of land demand for crop biofuels have not been eliminated: the huge areas of land currently occupied by rapeseed, cereal and palm monocultures for crop biofuels remain unavailable for alternative uses. This comes with climate and ecological costs, so-called opportunity costs. In principle, if the land was not used for growing crops, natural vegetation could regenerate and the land would slowly revert back to its natural state, e.g. forest. This would sequester carbon, create habitats for animals and plants and contribute to the restoration of healthy ecosystems. How much CO_2 could be sequestered from the atmosphere if the areas currently reserved for crop biofuel production were restored to or allowed to revert back to their (near) natural state? This question is central to determine whether reserving vast land areas for the production of crop biofuels actually contributes to climate change mitigation.

Official figures on the carbon footprint of crop biofuels do not provide any information on this; they ignore the foregone carbon storage potential of the used land – as if agricultural land was available for free, without impacts on climate and nature. In reality, there is enormous pressure on land – in Germany, across Europe and globally. Providing land for crop biofuel production competes strongly with providing land for other purposes, such as food production and the restoration of natural ecosystems.

A new study commissioned by DUH and conducted by the ifeu institute in Germany has calculated the carbon opportunity costs of crop biofuels, using Germany as a case study, with a view to providing a more complete picture of the climate impact of crop biofuels. The analysis considers two aspects:

» crop biofuels produced domestically in Germany, i.e. considering the land area within Germany which is used to grow crops for biofuels (which are partly consumed in Germany and partly exported).

» crop biofuels consumed in Germany, i.e. considering the total land area within Germany and abroad on which crops are grown for biofuels sold at German petrol stations.

The key findings are explained below.

2. Over 1.2 million hectares are occupied worldwide to produce crop biofuels for Germany

The most important domestic feedstock for crop biofuels in Germany is rapeseed; wheat, rye, corn and, to a lesser extent, sugar beet are also grown (Fig. 1).

Nearly half a million hectares of land, almost twice the area of Luxembourg, are used for these crops in Germany. Rapeseed alone occupies well over 300,000 hectares. In these numbers, the share of by-products (such as rapeseed meal, which is used as animal feed) of the total crop yield is already deducted from the area: only about 60% of rapeseed and cereal cropland is attributed to the production of crop biofuel. The actual land area covered by these crops is therefore significantly larger than the above numbers.

461,000 hectares of land are used in Germany for the production of crop biofuels:

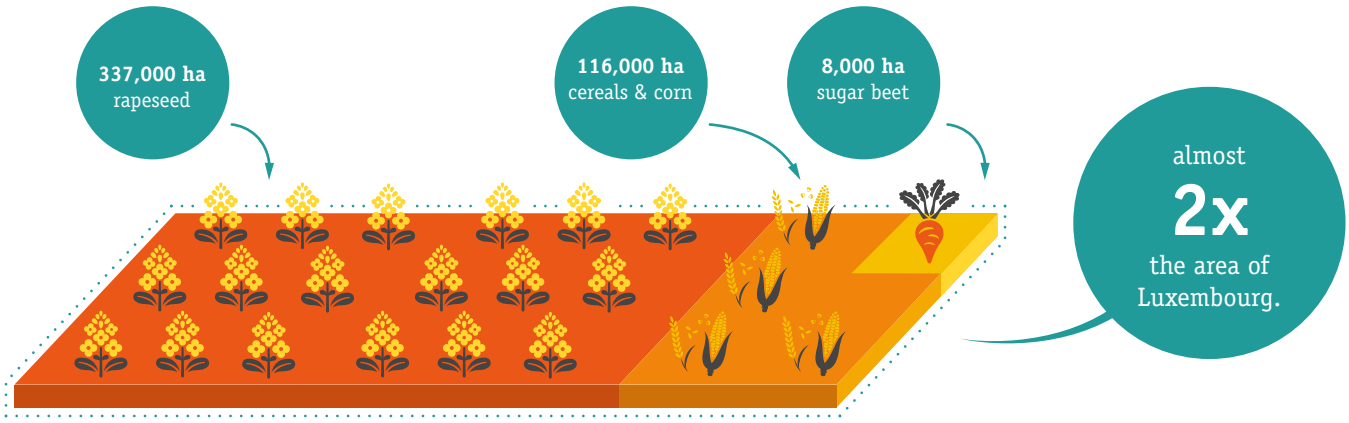

Figure 1: Land used for crop biofuels in Germany

Germany also imports crop biofuel and the feedstocks for it in large quantities from abroad. The most important imported feedstock is currently palm oil, which primarily comes from Indonesia. The use of palm oil diesel has grown significantly in past years and in 2020 *increased again* by almost 140% compared to the previous year. Germany also imports rapeseed from other EU countries and from Australia. Most of the cereals for bioethanol consumed in Germany are grown in Hungary, Poland and Ukraine.

Worldwide, more than 1.2 million hectares of land are dedicated to producing crop biofuels for Germany, an area almost five times the size of Luxembourg (Fig. 2). Again, a share of the land area corresponding to the by-products generated from the crops has already been deducted from this figure. The land areas for rapeseed, cereals and oil palms are of a similar size and each cover more than 350,000 hectares.

Over 1.2 million hectares of land are occupied worldwide for crop biofuels sold at German petrol stations:

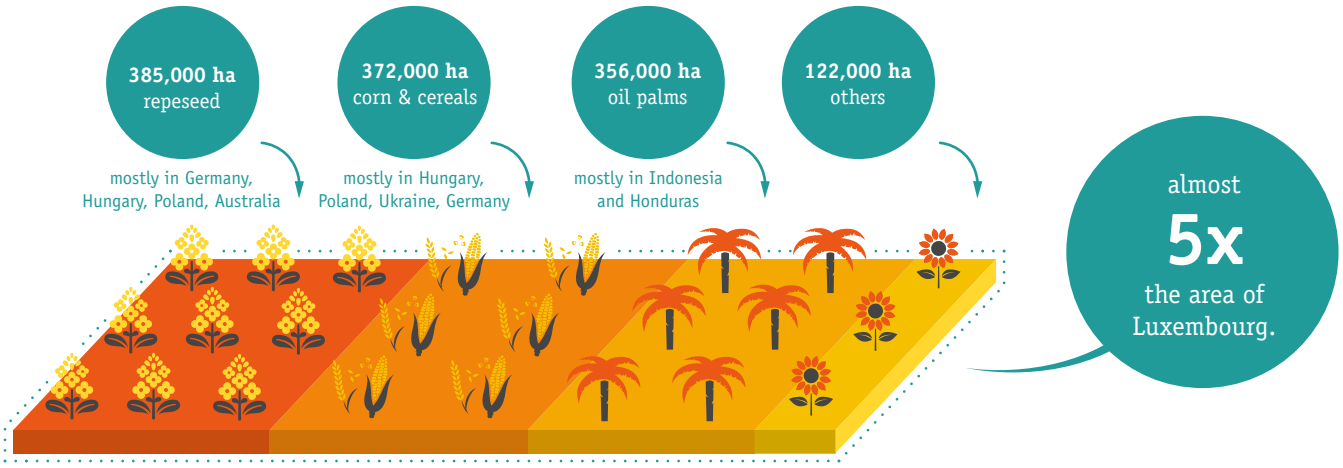

Figure 2: Land used globally for crop biofuels consumed in Germany

3. Using land for nature restoration is far more effective for climate mitigation than crop biofuels

The immense amount of land needed to produce crop biofuels comes with heavy climate costs because land is a very valuable and limited resource. If large areas of land are occupied with crops for biofuels, less land is available for other purposes, such as nature restoration. To obtain a complete picture of the climate impact of crop biofuels, this must be taken into account. In the DUH study, the climate impact of cultivating crops for biofuels is therefore compared to restoring natural vegetation on a land area of the same size.

In general, when land is given back to nature, the natural vegetation typical to the climate zone can regenerate over a longer period of time and sequester carbon from the atmosphere – this process may also be supported by suitable initial restoration measures. This means that natural carbon sinks can develop when land is restored to nature – in Germany and Europe, for example, through the regrowth of temperate continental forests, in tropical countries through secondary tropical rainforests.

The ifeu institute has estimated how much CO_2 could be sequestered over 30 years by natural vegetation regrowth on an area the size of today's biofuel croplands in Germany and abroad. The calculation takes into account that some croplands (such as palm oil plantations) also store a certain amount of carbon.

The analysis shows that almost 5 million tonnes of CO_2 could be sequestered from the atmosphere on average per year by restoring natural vegetation on an area the size of today's biofuel croplands in Germany. Considering a land area of the size used globally for producing crop biofuels for Germany, the regrowth of natural vegetation could sequester over 16 million t CO_2 on average per year. The use of crop biofuels in Germany, on the other hand, has enabled CO_2 savings of slightly more than 9 million tonnes of CO_{2eq} in 2020 according to official figures (although the ifeu institute questions the high value of this number). The comparison shows that the carbon opportunity costs of crop biofuels are significantly

higher than their alleged carbon benefit (Fig. 3 A, B). Overall, the balance is negative: the fact that large areas of land within Germany and worldwide are reserved for growing crops for fuel is not beneficial but damaging to the climate. This result is aligned with previous *scientific studies* on this topic.

The calculation is conservative. For example, only CO_2 sequestration by living biomass was taken into account while soil carbon storage was neglected.

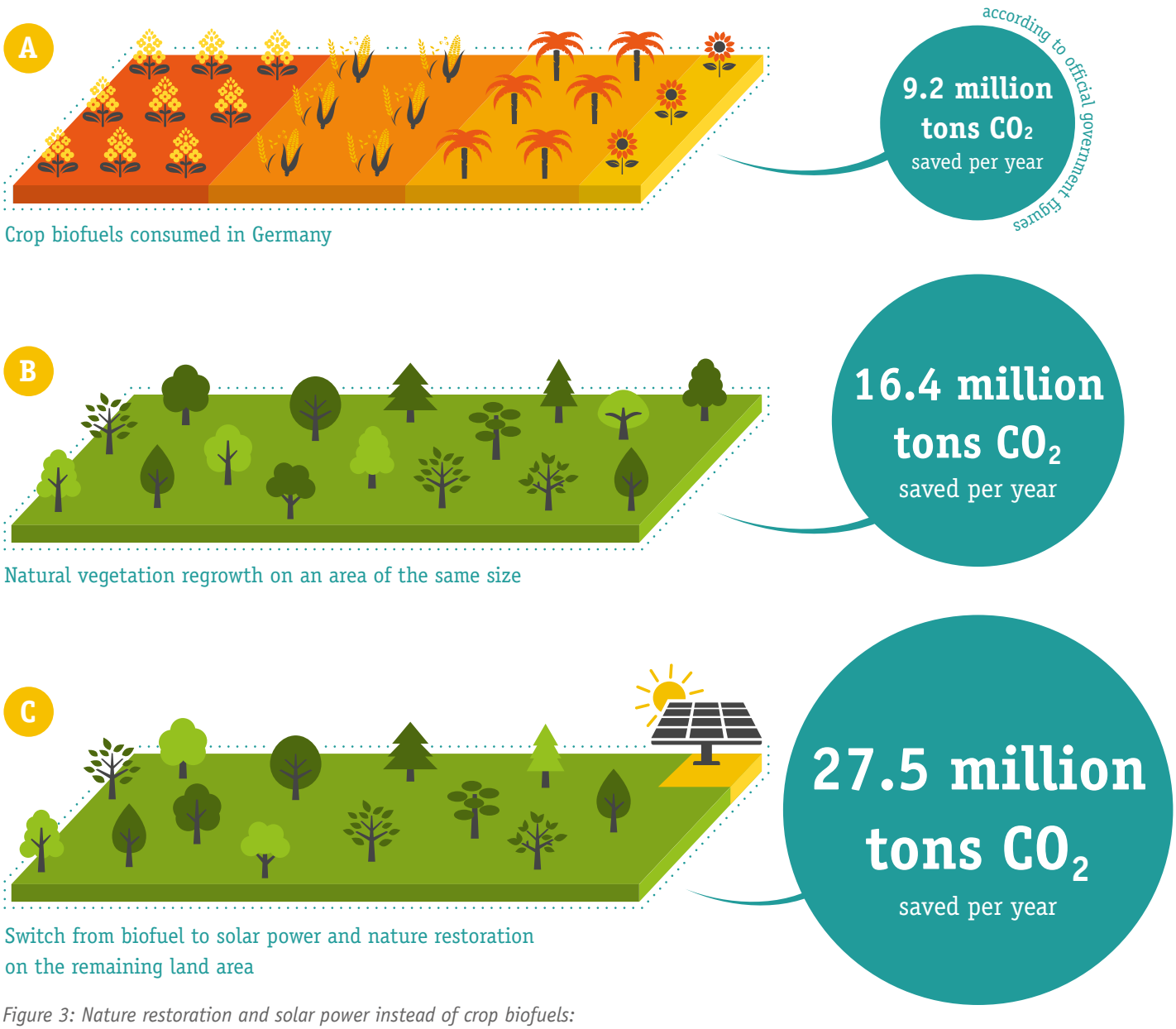

Figure 3: Nature restoration and solar power instead of crop biofuels: up to three times bigger climate benefit for the same amount of land.

4. Switching from crop biofuel to solar power for electric vehicles reduces land use by 97%

The above figures show that a scenario, in which current biofuel cropland was dedicated to nature restoration instead, would be beneficial for the climate – even if fossil fuel use increased again to replace crop biofuels. However, it goes without saying that switching back to fossil diesel and petrol would not be a good choice; the use of fossil fuels must be reduced to zero as quickly as possible in order to tackle the escalating climate crisis. This requires comprehensive changes in mobility, including a large-scale shift from private motorized transport to walking, cycling and public transport. The remaining road vehicles need to use efficient electric powertrains and renewable electricity.

Producing renewable electricity also requires land, but significantly less than the cultivation of crops for biofuels. According

to the ifeu institute's calculations, generating solar power via open-field photovoltaics is more than 34 times more efficient than producing crop biofuel. This means: land use would drop by 97% if the vehicle mileage currently covered by crop biofuels in Germany was covered by solar power instead (Fig. 4). Instead of 1.2 million hectares of land around the globe for crop biofuels, less than 36,000 hectares would be needed. That land area could be easily provided within Germany on a fraction of the current rapeseed cropland.

Producing solar power is 34 times more efficient than producing crop biofuel:

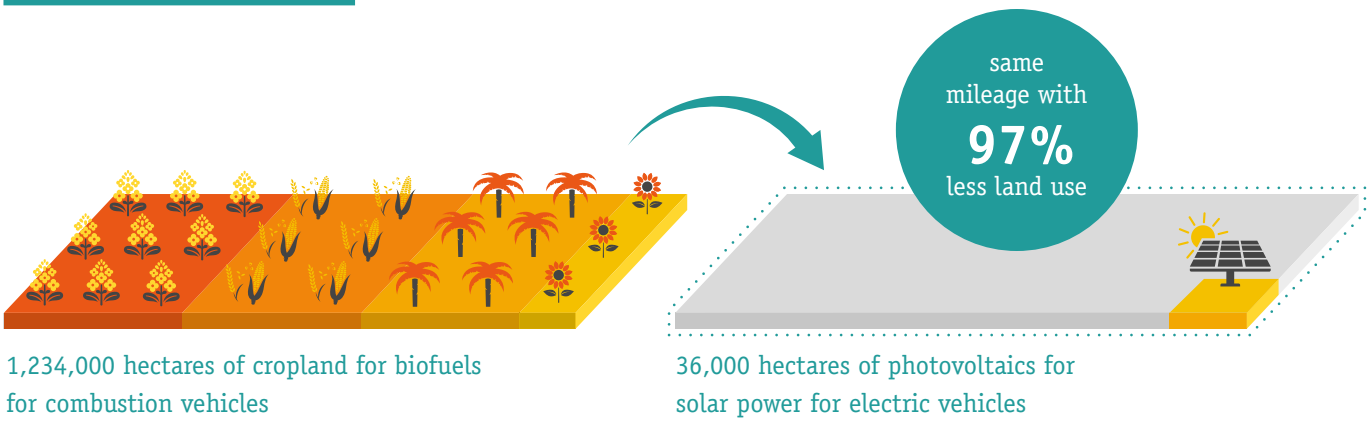

Figure 4: Land area required for producing crop biofuels or solar power for the same mileage

Combining the switch from crop biofuel to solar power with nature restoration on the remaining land area would enable average annual CO_2 savings of more than 27 million tonnes (Fig. 3C) – three times more than the climate benefit of using crop biofuels according to official figures.

5. Intensive agriculture for crop biofuels comes with significant ecological costs

The world needs to tackle not only the climate crisis, but also the biodiversity crisis, which is at least as threatening. All regions of the world, including Europe, are facing a dramatic loss of biodiversity. The latest *Report on the State of Nature* by the German Environment Ministry rates almost 70% of habitats in Germany as having inadequate or poor conservation status. The increasing cultivation of rapeseed and corn for energy use is explicitly named as one of the drivers. Intensive agriculture is often accompanied by high emissions e.g. of nitrogen and pesticides into the environment and is a major driver of biodiversity loss in open landscape, but also in other habitats.

This means that dedicating large areas of land to rapeseed monocultures and oil palm plantations has ecological opportunity costs in addition to the carbon costs described above: the land is no longer available as potential natural habitat for animals and plants, and the use of fertilisers and pesticides on the land actively harms biodiversity. The ifeu institute estimates that the 1.2 million hectares of croplands for German biofuel consumption cause as much ecological harm as 480,000 hectares of sealed land – that's equivalent to almost 10% of the entire land area sealed in Germany today. In contrast, nature restoration brings ecological benefits in terms of biodiversity and ecosystem quality, in addition to the climate benefits.

6. Phasing out crop biofuels reduces pressure on land and supports national and European climate and nature conservation targets

Restoration of natural ecosystems is firmly on the political agenda in Germany, the EU and internationally.

The German Climate Protection Law sets binding targets for natural carbon sinks such as forests and peatlands to sequester at least 25 million tonnes of CO_{2eq} per year from 2030 onwards, rising to 40 million tonnes of CO_{2eq} from 2045 onwards. How these targets will be met is completely unclear. The natural land ecosystems in Germany are in such a poor state that they are currently turning from carbon sinks to carbon sources. The *German federal government* itself projects that the land use sector will not only sequester no carbon until 2040, but will, in fact, *emit* up to 23 million tonnes of CO_{2eq} per year.

Germany has already missed its own target of restoring wilderness on 2% of the country's land area (about 715,000 hectares) by 2020 – less than a third of it has been achieved.

So when it comes to natural carbon sinks and nature restoration, Germany is currently way off track based on its own targets. This makes it all the more important that the Action Programme “Natural Climate Protection" announced by the German government is implemented swiftly and effectively.

At EU level, a new nature restoration law is about to be introduced to support natural climate mitigation and reverse biodiversity loss. It will contain legally binding restoration targets that Member States must meet. Nature regeneration and restoration is also a prominent topic internationally in the context of the UN Decade on Ecosystem Restoration.

The crux with all these efforts and initiatives is that nature restoration requires suitable land where human interference can be stopped or at least greatly reduced. At the moment, the opposite is happening: land conversion is increasing worldwide. The German government's target of reducing new land conversion to 30 hectares per day is a long way off. This makes it all the more urgent to take advantage of opportunities to reduce the pressure on land. If Germany ends both production and use of crop biofuels, this will reduce the demand for agricultural land within Germany by almost 0.5 million hectares and worldwide by more than 1.2 million hectares. As explained earlier, areas of this size have significant potential as natural carbon sinks, as well as for ecological regeneration. Considering EU-wide use of crop biofuels, the amount of land involved is much larger still.

It is important to note that this does not mean that the specific agricultural fields currently used to grow crops for biofuels should instead be dedicated to nature restoration. Fertile cropland should primarily be used for food production, while nature restoration achieves the best results on large, contiguous areas. Phasing out crop biofuels significantly reduces overall demand for land and thereby supports policy targets to preserve and strengthen natural carbon sinks and boost biodiversity.

Conclusion

Emissions from transport in Europe have increased over the past 30 years, and there is an urgent need for action to reduce greenhouse gas emissions. Given the urgency, it is all the more harmful when fake solutions are promoted in this context. **Reserving huge swaths of land around the globe for producing crop biofuels for combustion engine cars is an enormous waste of an extremely valuable and limited resource: land.** Crop biofuels are officially considered climate-friendly in EU emission accounting, but in reality the climate costs far outweigh any benefits, due to the enormous demand for land. Phasing out crop biofuels is an effective step to reduce pressure on land, which offers significant potential for supporting climate mitigation and nature restoration. In addition to a fundamental shift in mobility towards active and public transport modes, a rapid phase-out of the internal combustion engine and a switch to efficient electric powertrains is necessary.

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