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Position Paper on Land Use in the Environmental Footprint (EF) Method Review: recognising the benefits of natural fibre production

Executive Summary

The EU Environmental Footprint (EF) Method currently frames land use for textile fibres primarily as an environmental burden. This risks systematically disadvantaging land-based and extensive natural fibre systems, even where responsible management can maintain or improve soil condition and broader landscape outcomes.

Within the EF Method, land use impacts are assessed using LANCA 2.5 across four soil-related indicators. However, the current application relies heavily on national averages, uses reference conditions that can be poorly aligned with realistic counterfactual land uses, and scales impacts strongly with land occupation. As a result, low-intensity and rangeland systems may receive disproportionately high land-use scores, potentially favouring more intensive production models and limiting recognition of improvements from better land management.

This paper explains why these methodological choices reduce scientific robustness and proposes refinements to improve fairness and policy usefulness, including more context-sensitive characterisation, improved reference conditions, and the ability to reflect measurable outcomes from sustainable land stewardship.

Introduction

The EU's Environmental Footprint (EF) methods currently consider the use of land for the production of textile fibres as an environmental burden. Even though natural fibre production can provide ecological, social and economic benefits through responsible land management, the one-dimensional approach of the current EF methods systematically penalises natural fibre production.

Most natural fibres – whether from grazing livestock or cultivated crops – are produced outside Europe in diverse farming systems. A view of land use that does not include the many ecological, social and economic contributions of responsible farming fails to reflect the global realities of fibre production and undervalues the critical role these systems play in maintaining biodiversity, regenerating soils, sequestering carbon, and supporting rural livelihoods within their local productive contexts. Similarly, there is a strong movement towards the adoption of regenerative farming practices across Europe and beyond which do not conform to the typical datasets that have been established for LCAs.

Land use in the EF methods: the role and limits of LANCA

Land use impacts in the EF methods are assessed using the LANCA 2.5 (Land Use Indicator Value Calculation in Life Cycle Assessment) model, which is also applied in the Product Environmental Footprint Category Rules (PEFCR) for Apparel and Footwear. LANCA estimates soil quality changes across four categories – erosion resistance, groundwater regeneration, mechanical filtration, and biotic production.

While comprehensive in concept, LANCA's implementation within the EF methods is problematic for agricultural systems. It applies fixed national averages rather than site-specific data, and assumes that all land occupation reduces soil quality compared to a "natural" reference state. As a result, extensive grazing or low-intensity fibre systems - where land area is large but environmental impact per hectare is low - are scored as having disproportionately high impacts. This favours intensive, high-input systems and fails to recognise improvements from regenerative or sustainable land management.

Regenerative agricultural practices are increasingly recognized as being environmentally beneficial. Regenerative practices have been known for centuries (the Romans used crop rotations), and such practices have been formally taught in agricultural universities since at least the 1930s. Today, almost all farmers implement at least some practices that are recognized as regenerative, and many farms are fully regenerative, even if they have not yet been certified. Cotton and wool, the most important of the farmed fibres by volume, require significant technical expertise to produce successfully. Consequently, producers of cotton and wool tend to be the most technically advanced within farming communities, and cotton and wool tend to be produced by technology leaders within agriculture. In many cotton-producing regions for instance, cotton is increasingly grown with agroforestry and mixed-cropping systems – such as cotton intercropped with legumes or integrated with shade and fruit trees – which improves soil moisture, reduces pest pressure, and enhances biodiversity at field and landscape levels. Yet, the current EF methods ignore the beneficial impacts of the implementation of regenerative agricultural practices and assumes that natural fibres are grown no differently and have the same environmental impacts on land and the environment as crops and animals used for food.

Because LANCA multiplies "soil impact" by "land area", it effectively treats all land as equally scarce and valuable, disregarding regional context or ecological function. This introduces a systematic bias against natural fibres, particularly from regions such as Australia, South America, and Africa, where land is abundant and often managed effectively for biodiversity and resilience.

The European land use framing

The European perspective on land use often reflects the specific challenges faced within Europe, such as intensive monoculture farming, high fertiliser and pesticide inputs, nutrient surpluses leading to eutrophication of water bodies, soil degradation, biodiversity loss, and increasing competition for land from bioenergy, urbanisation, and infrastructure (EEA, 2023; IPBES, 2019).

These problems are characteristic of Europe's highly industrialised and high-yield farming systems. However, they are not universal. In many non-European contexts where natural fibres are produced, land use looks very different: systems are often extensive, rainfed, low-input, and embedded in local ecologies and livelihoods. For example, while Europe struggles with manure management and nitrogen surpluses from intensive agriculture, African and South American rangelands managed for fibre and food are shown to sequester carbon, enhance biodiversity, and maintain ecosystem resilience (Kotzé et al., 2025; Herrera Calvo & Alexander, 2024).

Additionally, a wide variety of crops in Africa and Central Asia are produced with very little to no pesticides due to the absence or unaffordability thereof. By applying a European lens that assumes land use is inherently harmful, the EF methods risk overlooking the regenerative and multifunctional role that fibre-producing landscapes play elsewhere in the world (FAO, 2021).

Yet Europeans have a direct stake in this global perspective: the majority of the natural fibres used in textiles, apparel, home furnishings and in composites sold in Europe are grown outside of the EU, meaning that the environmental and social outcomes of fibre production abroad are closely tied to Europe's own consumption footprint. Moreover, because the EU is setting global benchmarks for sustainable textiles through its EF methods, it carries a unique responsibility to ensure that its methods accurately represent the realities of fibre systems worldwide.

This underlines why policy indicators must be balanced and context-sensitive: metrics designed around European land use problems should not be uncritically applied to fibre systems globally, as this risks distorting fair comparisons and undermining sustainable production in the Global South.

Land use as an environmental gain, not just a cost

The EF methods' land use indicator is focused on harm, but omits the gains of well-managed land systems. When assessing land-use indicators, it is important to note that the ecological processes are all inter-connected and do not function in isolation of one another. Thus, in practice we often observe that a positive effect on the water cycle will have a positive effect on energy flow, the nutrient cycle and biodiversity. To illustrate, see the table in Appendix 1 which explains the benefit to each ecological process when land is managed for essential environmental improvements.

Both extensive grazing systems and responsibly cultivated fibre crops deliver essential ecosystem benefits:

- **Water cycle regulation** – Healthy soils from grasslands and fibre crop fields improve infiltration, reduce erosion, and improve water retention (Kotzé et al., 2025; Stanley et al., 2024).
- **Nutrient cycling** – Animal manure, cover cropping, and crop residues return nutrients to soils, sustaining fertility and microbial activity (Stanley et al., 2024). Cotton is unusual among commercial crops in that it has a tap root, which typically descends 1.5 meters. Thus cotton, grown in rotation with grains and oilseeds, tends to break up hardpan and bring nutrients to the surface where crops with horizontal root systems can utilize them. In mixed farming systems, livestock play a complementary role by supplying manure and other bio inputs used in composting and soil amendment processes, further supporting microbial activity and soil carbon build up in cotton fields.
- **Energy flow and productivity** – Grazing stimulates new plant growth, while rotational cropping systems enhance long-term productivity (Kotzé et al., 2025).
- **Biodiversity** – Managed rangelands promote forb and pollinator diversity (Bråthen et al., 2021), while fibre crops such as hemp and flax support habitat for insects and soil organisms. In smallholder cotton landscapes, which are often mosaic agroecosystems, cotton plots are interspersed with trees, hedgerows, food crops and fallows. This patchwork structure also provides habitat diversity, supports pollinator movement, and maintains ecological connectivity at the landscape scale.

These benefits are not incidental – they are the result of agronomic practices taught to farmers for decades resulting in careful stewardship by land managers across generations.

Fibre systems as stewards of ecosystems

Natural fibre production is embedded in ecological processes:

- **Grazing systems** – Livestock co-evolved with grasslands and remains central to their healthy functioning. Grazing reduces fire risk (Karp et al., 2024), incorporates organic matter into soils, disperses seeds, and maintains plant biodiversity. Historical evidence shows herbivore densities in the past were at least as high as today (Manzano et al., 2023), underscoring the natural role of herbivory in ecosystems.
- **Cultivated fibres** – Cotton, hemp, and flax are renewable crops that can be rotated with food crops, improving soil structure, reducing pest cycles, and diversifying farm income. Fibre crops thrive in rainfed conditions and provide valuable residues for soil carbon build-up and erosion control (Kotzé et al., 2025; Stanley et al., 2024). Cotton stalks and other crop residues, when retained or incorporated into soils, contribute to soil organic carbon accumulation and help reduce erosion – especially in smallholder systems where residues are used as mulch or compost. Increasingly, a share of cotton residues is also converted into

biochar, which offers a stable form of carbon sequestration while enhancing soil water holding capacity and nutrient retention.

- **European climate resilience** – In Europe, responsibly managed fibre systems also play a crucial role in mitigating environmental risks linked to climate change. Permanent vegetative cover, soil organic matter accumulation, and integrated grazing or crop rotation practices can reduce flood risk, enhance infiltration, and lower wildfire intensity. These same land management principles that support natural fibre production also strengthen Europe's resilience to extreme weather events, providing a tangible local benefit of regenerative fibre systems.

In these cases, fibre systems provide long-term ecological functions while producing renewable materials.

Rural livelihoods and global food security

Agricultural land use must be understood not only in ecological terms but also in social ones. According to the Food and Agriculture Organization (FAO), over 90% of the world's farms are family-owned, representing more than 550 million farming households and producing roughly 80% of the world's food and fibre. Agriculture covers around 37-38% of the world's terrestrial land according to FAO and Our World in Data. Yet, the sector contributes only about 4.2–4.3% of global GDP - a mismatch that reflects the undervaluation of farming's role in safeguarding natural capital.

Between 40 million and 50 million households are involved in production of natural fibres, and when hired labor is considered, total employment in the agricultural segments of natural fibre value chains is estimated at between 150 million and 200 million. (DNFI, January 2025)

In Europe, agricultural landscapes used for fibre production are also central to rural economies, as the bio-based industry accounts for EUR 583 billion in economic added value, with EUR 29 billion generated from the bio-based sector, which employed 700 000 people in 2021. (JRC, 2025)

Rangelands alone cover 54% of Earth's land surface and support the livelihoods of 2 billion people (Herrera Calvo & Alexander, 2024). Fibre crops are likewise essential income sources for millions of smallholder farmers worldwide. Policies that treat land use only as a cost, risk undermining rural resilience and food security, particularly in the Global South.

Policy implications – towards balanced indicators

The EF methods' current land use indicator does not:

- Differentiate between different land management systems such as regenerative land management.
- Capture positive ecosystem services from well-managed fibre systems.
- Consider biogenic carbon flows.
- Consider on-farm variations adequately.
- Incorporate the socio-economic contributions of rural and indigenous communities.
- Adequately represent real-world conditions due to methodological limitations in LANCA, which currently penalises extensive systems and ignores the benefits of regenerative land management.

If land use is treated solely as a negative impact, as is the case in most current datasets, the EF methods not only risk distorting outcomes but also miss a critical opportunity. Well-managed fibre landscapes demonstrate that land can deliver measurable climate benefits at scale while at the same time supporting rural livelihoods and local economies. Recognising these positive outcomes is essential if the EF methods are to provide an accurate and balanced picture of land-based production systems.

If LANCA continues to be used within the EF methods, its methodology must be improved. This includes developing regionally-specific, and crop/animal-specific, characterisation factors to replace misleading national and agricultural averages, allowing recognition of positive soil and biodiversity outcomes, and selecting reference conditions that reflect realistic alternative land uses rather than pristine ecosystems.

The European Commission's Technical Advisory Board (TAB) is already examining how the Environmental Footprint method can better reflect agricultural practices and soil dynamics. Current discussions explore adding scaling factors for soil organic carbon and biodiversity, supported by evidence from Smith et al. (2019) and García-Palacios et al. (2018). These studies confirm that management and biodiversity directly influence ecosystem stability and carbon storage. With modern measurement, reporting and verification (MRV) systems and remote-sensing technologies, it is now feasible to quantify improvements in soil carbon, vegetation cover, and land condition - providing a credible way to recognise positive land management within the EF methods.

Current EF methods indicators also risk creating policy incoherence. Treating all land use as a penalty conflicts with the policy objectives of the CAP, the Soil Strategy and Soil Monitoring Law, the EU Bioeconomy Strategy and the circular economy agenda, all of which recognise the importance of nature-positive land management and the ecosystem benefits provided by well-managed agricultural landscapes. A coherent policy framework must reward, not penalise, renewable land-based production systems that deliver measurable environmental and social benefits.

Until these methodological improvements are achieved, the EF methods indicators should not be used to compare products or inform labelling, as doing so would risk misleading consumers and disadvantaging renewable, land-based systems.

We urge the European Commission to develop indicators that:

- Recognise ecosystem services such as biodiversity support, water regulation, soil health, and fire prevention (Bråthen et al., 2021; Karp et al., 2024; Kotzé et al., 2025).
- Incorporate circularity and renewability as core sustainability measures (Stanley et al., 2024).
- Include socio-economic dimensions of land stewardship, reflecting the dependence of hundreds of millions of people on fibre-producing systems (Herrera Calvo & Alexander, 2024).
- Utilise biogenic carbon flow accounting according to ISO 14067:2018 when conducting life cycle assessments.

If land use is treated only as a cost, then the very act of stewarding nature becomes a liability. The EF methods must evolve to reward regenerative, nature-positive production.

Conclusion

Land use should not be treated as an inherent liability penalising products forthcoming from it. For both animal and plant fibres, responsible land management is a source of ecological resilience, biodiversity, soil carbon, and rural livelihoods. Recognising these contributions within the EF methods will ensure that policy and labelling frameworks reflect the true value of land-based production systems and support the transition to a sustainable, circular economy.

Recognising the regenerative potential of land use is also key to achieving the ambitions of a circular economy and the EU's Bioeconomy Strategy, both of which depend on renewable materials such as natural fibres to replace fossil-based resources and close material loops. Integrating these perspectives would ensure that the EF methods contribute to Europe's broader transition towards a low-carbon, resource-efficient and nature-positive economy. The application of regenerative principles enhances system resilience while stabilising and enhancing the earth's water, nutrient, carbon, and biodiversity cycles while contributing to food security. A regenerative future is a future inclusive of soil health and productive agricultural landscapes.

Appendix 1: Land-Use Benefits of Natural Fibre Systems

Dimension	Grazing-based fibres (e.g. alpaca, cashmere, mohair, wool)	Crop-based fibres (e.g. cotton, flax, hemp)
Soil health & soil carbon	Trampling incorporates plant litter, manure adds nutrients, enhances soil microbial activity and carbon sequestration	Crop residues and root systems add organic matter, improve soil structure, reduce erosion, potential for carbon sequestration through regenerative practices
Water cycle	Grazing improves soil infiltration and water retention, prevents erosion, increases soil water-holding capacity	Deep-rooted crops like cotton, hemp and flax improve soil porosity, reduce runoff, and increase drought resilience
Nutrient cycling	Urine and manure redistribute nutrients, sustaining fertility; enhances microbial processes	Crop rotations and cover crops recycle nutrients, reduce synthetic fertiliser and pesticide dependency
Biodiversity	Grazing maintains wildflowers and pollinator diversity, prevents grassland monocultures, supports grassland-dependent wildlife	Fibre crops provide habitat for insects and soil organisms; rotations diversify agroecosystems and reduce pest cycles
Fire regulation	Herbivores reduce fuel loads and fire risk in savannas and rangelands	Crop cover reduces erosion and can limit wildfire spread in mixed landscapes
Renewability & circularity	Fibres are annually renewable, biodegradable, and integrated with natural cycles	Crops are renewable, biodegradable, and residues can be reintegrated into soil or used as by-products
Socio-economic value	Supports pastoralist communities and rural livelihoods, critical income for ~2 billion people dependent on rangelands	Provides income for millions of smallholder farmers globally, often grown in mixed systems with food crops
Cultural and heritage value	Pastoralism is deeply rooted in heritage and indigenous practices	Traditional cultivation of cotton, flax, hemp underpins rural economies and crafts

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