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Life cycle assessments of synthetic materials and natural products like leather - a contrast

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Dietrich Tegtmeyer
Global Head of Business Development & Industry Relations, TFL Ledertechnik GmbH, Germany

Correspondence: Dr. Dietrich Tegtmeyer, Global Head of Business Development & Industry Relations, TFL Ledertechnik GmbH, Germany, Tel +49 175 3052891, Email dietrich.tegtmeyer@tfl.com

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Introduction

There is a wide variety of textile knitted fabrics, and the raw material base is crucial for their usage properties, but also their opportunities and risks after use. The sustainability process in the industry is currently in the beginning of the 4th epoch, the so-called "regenerative era". After the "Harm Reduction Era", the "Strategic Sustainability Era", the "Purpose Driven Era", a new increase on the way towards a sustainable materials management. In the "Regenerative Era", the focus will be on maximizing or optimizing the cycle in materials management and the proportion of biobased raw materials as its origin.

Leather as a material can play a renewed trend role here in the upcoming years, if two things are ensured:

1) the used hide must come from an ethically and ecologically sustainable source
2) and the manufacturing process must be resource-saving, climate-neutral, and in balance with the environment.

Both of these things are already agreed upon in a "Manifesto" in the International Council of Tanners (www.leather-council.org), and are also already being realized in large parts of leather production, at least clearly defined as a near-term goal in a continuous process of improvements.

LCA benchmark difficulties of natural versus synthetics

Unfortunately, this is not reflected in today's life cycle assessments; on the contrary, many things are misinterpretated in my view. One of the reasons for this is that the algorithms behind them are tailored to synthetic manufacturing processes, and natural-based processes are thus systemically disadvantaged. This is essentially because the boundaries for raw material origin cannot be clearly defined, and evaluations of many natural impacts cannot be made holistically. And if you only look at one part of an equation, you usually get the wrong picture.

Example: If you believe in the data of www.waterfootprint.org , a data base, that is often taken as the so-called scientific statistic for many presentations, it takes about 17,000 liters of water to produce 1 square meter of leather from a cow. In a sustainable tannery, however, only about 150-200 l of process water is needed; this is taken from the surface water, used for tanning during the process, then treated and returned to the surface water in a clean state. Thus, on the one hand, the water is not "consumed", but "used on loan", so to speak. Moreover, this amount of water is only about 1% of the amount stated in the data base, and, by the way, the consumption of water per square meter of leather is about a factor of 10 lower than in the production of a comparable area of jeans-cotton fabrics, if I am informed correctly.

So, what is it about the remaining 16,800 l of water that is supposedly "consumed" per sqm of leather, given an average 5-8 year lifetime of a bovine, 5% allocation of a hide per body weight and about 5 sqm of skin area per bovine. It should be clear that a cow cannot drink 10,000 l of water per day! No, the by far largest part of the water consumption is the rain that falls on the pasture area during this period, is bound via photosynthesis as growing grass, and thus serves the animal as food. The fact that a comparable amount of CO2 is also bound during photosynthesis is unfortunately not taken into account in the LCA.

The example makes clear, I think, what kind of insanity these LCA algorithms generate and what kind of twisted facts they can often lead to; rain falls whether there is a cattle on the pasture or not. When pasture is grazed by a cow, it has a variety of positive effects: regrowth promotes humus formation in the soil, the manure fertilize the pasture and promote insect diversity, and in many areas help keep the pasture from drying out. Every methane molecule that cattle emit is broken down again after a few years to CO2 in the atmosphere, exactly the amount of CO2 from which it was previously bound by photosynthesis. The whole process is therefore carbon neutral from the point of view of the law of mass action. About 75% of the agricultural area is land that is not suitable for agriculture and would dry up in many places if no animals grazed on it. Why is such a sustainable "land use" evaluated negatively in a LCA algorithm; actually, livestock should get a credit for it.

This is only one of many examples, but a very clear and convincing one, in my opinion, why the environmental footprint category rules are not suitable for natural products. A LCA comparison of a pure plastic-based textile with a natural-based material like leather is therefore a comparison of plastic apples with real pears - completely nonsense!

Secondly, I would like to briefly mention another regenerative aspect of leather. Plastic, even if it has been partially recycled, degenerates in nature only physically, i.e. particles/fibers become smaller and smaller through abrasion, and end up as microplastics in the eco-cycle; they cannot be absorbed by any metabolic cycle. In contrast: you will never be able to detect a leather fiber in the stomach of a dead whale, but in which you can find up to 70 kg of plastic; why? Because it has already been completely returned to the ecocycle along the way, with a positive side effect: the leather fiber is an excellent biofertilizer that releases nitrogen in a slow release process; this too would have to be assessed with an LCA credit. Most LCAs are craddle to gate, meaning they evaluate the creation process up to commercialization. The impact after use, on the other hand, is

not yet included in this data, but I believe it is extremely important from a regenerative cycle perspective.

Conclusion

Without going into further detail, I will leave it at this. My credo is that in a regenerative materials economy, we have to take the right KPIs as guiding parameters, such as proportion of bio-based carbon in the material and eco-cycle capability of the raw material base. Existing algorithms for life cycle assessments are good for benchmarking two plastics, to stay with the example above: a plastic apple with a plastic pear. But they are not suitable for assessing the sustainability value of a natural product such as leather.

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Conflicts of interest

Declare if any conflict of interest exists.

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