14

Author:
International Wool Textile Organisation

Wool Life Cycle Assessment

What is LCA?

The International Standards Organisation (ISO) defines Life Cycle Assessment (LCA) as a technique to assess environmental impacts of products, processes or services.

An LCA for a woollen sweater, for example, would look at the environmental impacts across its entire life from raw material production (cradle) to disposal (grave).

While the social and economic effects of textiles are also important pillars of sustainability, LCAs currently focus on environmental aspects of resource use as well as depletion and emissions to land, water and air.

On Farm

For wool the life cycle starts on the farm, where wool grows naturally on sheep.

For a complete LCA, data on CO2 and methane emissions, water consumption and energy used needs to be collected. Sheep and their wool are complex to measure for several different reasons:

- There is a wide variety of sheep breeds growing a wide variety of wool
- Sheep live in almost every country in the world
- Sheep are reared in many ways ranging from intensive to extensive farming

In other words, the environmental impacts of wool from a sheep raised in the Scottish mountains will be different from that of wool from a sheep raised in the Australian Outback.

Adding to the complexity is the fact that sheep provide not only wool but also meat, milk, lanolin and other by-products. This means that environmental impacts such as CO2 emissions need to be divided between the different products. The ISO defines how allocations between products shall be done.

The choice of allocation method will influence the outcome of the LCA study. Researchers have found that the most exact method for wool LCAs is the biophysical allocation method. The biophysical method looks at the proportion of protein required to produce each of the sheep's by-products.

Read more about conducting LCA for wool textiles in IWTO's **Guidelines for Wool LCA**.

© IWTO 2019

Processing and Manufacturing

The second life cycle phase is the processing and manufacturing stage. Here data is collected on environmental impacts related to water, energy and chemical use.

In the past, many published wool LCAs either used outdated data to calculate the environmental impacts or used so called proxy data from other industries. This has led to inaccurate calculations and false claims about wool's ratings.

As with data on-farm, it is important to collect real life data which is not based on assumptions in order to assess the true environmental impacts.

Use Phase

The use phase is where the environmental impacts of the consumer using, wearing and maintaining the wool product are measured.

Again, this stage is complex to measure and because of that is very often neglected or left out. However, LCA methodology requires that the complete life cycle be considered in order to make accurate calculations. Assessments that leave out the use phase risk reaching erroneous conclusions.

In terms of measuring the true environmental impacts of a wool product, this is the stage where wool has a very low environmental impact compared to other fibres. Research has shown that wool garments are washed less often, washed at cooler temperatures, are mostly air-dried rather than tumble-dried and last longer than other garments made of other fibres. To learn more, read IWTO's Fact Sheet about Wool's Use Phase on www.iwto.org.

End of Life

Wool's impacts at end of life are also low compared to those of other fibres:

- **Wool garments last a long time and are often donated or re-sold for a second and third use phase.**
- **Wool garments lend themselves well for recycling into new yarn (closed loop recycling) or other recycled products (open loop recycling). Recyclability is an important factor for sustainable products, because the environmental impacts created throughout the supply chain become relative the longer a garment is worn or a product is used.**
- **Being a natural fibre, wool readily biodegrades in land and in water – another important aspect in LCA.**

About IWTO

With a world-wide membership encompassing the wool pipeline from sheep to shop, the International Wool Textile Organisation represents the interests of the global wool trade. By facilitating research and development and maintaining textile industry standards, IWTO ensures a sustainable future for wool. To learn more about IWTO and its activities, visit www.iwto.org.

INTERNATIONAL WOOL TEXTILE ORGANISATION IWTO

Guidelines for conducting a life cycle assessment of the environmental performance of textiles. International Wool Textile Organisation Wool LCA Technical Advisory Group (2016): https://www.iwto.org/sites/default/files/files/iwto_resource/file/IWTO%20Guidelines%20for%20Wool%20LCA.pdf

Stephen G. Wiedemann, Stewart F. Ledgard, Beverley K. Henry, Ming-Jia Yan, Ningtao Mao, Stephen J. Russell (2015): Application of life cycle assessment to sheep production systems: investigating co-production of wool and meat using case studies from major global producers. Source: https://link.springer.com/article/10.1007/s11367-015-0849-z

Wiedemann S., Yan, M-J, Henry, B.K, Murphy CM 2016, 'Resource use and greenhouse gas emissions from three wool production regions in Australia', Journal of Cleaner Production, 122, 121-132.
Source: https://www.sciencedirect.com/science/article/pii/S0959652616001700

Henry BK, Russell SJ, Ledgard SF, Gollnow S, Wiedemann SG, Nebel B, Maslen D, Swan P (2015) "LCA of wool textiles and clothing", In: Handbook of Life Cycle Assessment (LCA) of Textiles and Clothing. 217-254 https://www.sciencedirect.com/science/article/pii/B9780081001691000101?via%3Dihub

Russell SJ, Ireland A (2016) "Review of Wool Recycling and Reuse", In: Fangueiro R; Rana S (eds.) Natural Fibres: Advances in Science and Technology Towards Industrial Applications. 12. RILEM Book Series. Dordrecht: Springer. 415-428 https://link.springer.com/chapter/10.1007%2F978-94-017-7515-1_33

Laitala, Kirsi; Klepp, Ingun Grimstad; Henry, Beverley (2018): Does Use Matter? Comparison of Environmental Impacts of Clothing Based on Fiber Type. Source: https://oda.hioa.no/en/item/does-use-matter-comparison-of-environmental-impacts-of-clothing-based-on-fiber-type