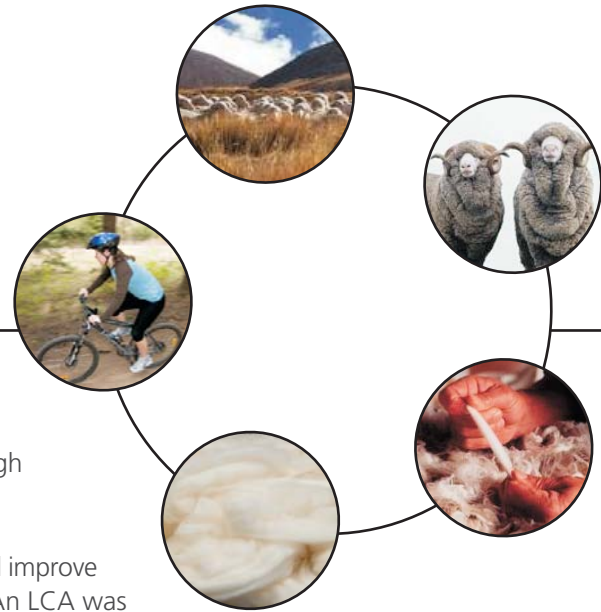


Life Cycle Assessment : New Zealand Merino Industry

Merino Wool Total Energy Use

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Life Cycle Assessment (LCA) is a tool used to measure the impact of a product on the environment, from the extraction of raw materials through to the use, disposal or recycling of the final product.

Life Cycle Assessments are a means for businesses to measure, address and improve eco-efficiencies throughout the life cycles of their products or services. An LCA was conducted on the New Zealand Merino industry by Andrew Barber, AgriLINK New Zealand Ltd, on behalf of Merino Inc to substantiate New Zealand's clean and green environmental image in relation to the production of New Zealand Merino fibre.

The project objectives were to conduct an LCA of Merino fibre to quantify and advance the understanding of the resource inputs in New Zealand Merino farms, in particular total energy used in the production of Merino fibre, and to review existing LCA literature on other fibres.

Twenty four farms were surveyed to calculate the average energy use on New Zealand Merino farms. This farm data was then combined with energy use data for scouring, top-making and transport to provide the total energy cost per kg of top delivered to spinning mills in China. Merino fibre production has a total energy use of 46MJ/kg (21MJ/lb) wool tops. The analysis found that half of the total energy cost was attributed to farm production, with the rest being accounted for in scouring and top making (47%), and transport (3%). Scouring is the highest single energy use and accounts for almost 90% of the energy used in processing to Merino top.

Regarding energy production, it is relevant to note that in 2004, 64% of New Zealand's electricity generation came from renewable sources (MED, 2005). Renewable energy accounts for approximately 15% of total energy use or 7 MJ/kg (3MJ/lb); 10% of on-farm energy and approximately 20% of processing energy is generated from renewable energy sources.

The results of this assessment and comparative published information on alternative fibres show that producing New Zealand Merino wool fibre uses significantly less energy resource than it takes to manufacture fossil fuel dependent man-made fibres. For example, nylon manufacture uses over 5 times more energy, acrylic 3.8 times, polyester 2.7 times.

This project has produced detailed input inventories of resource use in the production of New Zealand Merino fibre that can be built upon by expanding the number of impact categories, conducting sensitivity analyses and determining environmental hotspots. Scouring requires further investigation to increase confidence in the data for this part of the production system. Other parts of the wool pipeline - spinning, dyeing, apparel manufacture, customer use, and disposal should also be included in an extended study. This work will continue in the near future.

Findings from current longer term R&D projects, being carried out by other industry stakeholders in New Zealand will assist in further developing LCA approaches for all wool products, including Merino. Meanwhile, the results from this study provide an initial quantification of energy impacts that will help the Merino industry understand its position relative to other fibres.

NOTE:

- This LCA assessed the New Zealand Merino production system. Published literature was used to generate information on the production of alternative fibres. Most literature lacks well described system boundaries and detailed inventories, which would allow the total energy use results to be verified.
- ISO recommends that when comparing products a sensitivity and uncertainty analysis be conducted. This was not possible for this study due to the lack of a complete set of raw data for each product, however on-going work in this area will ensure these analyses are undertaken.
- Wool processing data is the area with which the least confidence is associated, due to the difficulty of finding suitable literature and industry data. It is also understood that there is considerable variation in energy use between different processing plants.
- The nature of agricultural production systems imposes unique constraints on LCAs. Manufacture of fossil fuel dependant man made fibre occurs in a confined factory. The system is simpler to contain, compared to agricultural systems which are exposed to data variability due to a number of factors. Variation between farms, site dependency of farms, a situation in which some farms are heavily influenced by specific land attributes and related climatic and environmental factors, difficulty in defining system boundaries where outside factors influence conditions inside boundaries of an agricultural system and in addition, system knowledge where unpredictability and complexity of biological processes imbedded in agricultural systems limits understanding of systems. Because Merino farms largely produce products in addition to Merino wool e.g. meat and crops, allocating inputs and outputs to various products is often difficult in farming systems.

This study is in the process of being peer reviewed for additional credibility.