Green Wool Facts

The Wool Industry & The Environment

Send any comments or inquiries to:

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The wool industry & the environment

Wool is increasingly seen by caring consumers as a sustainable lifestyle choice for fashion and interiors.

In 2010, HRH The Prince of Wales launched the Campaign for Wool with the purpose of renewing interest in and creating a greater awareness of wool's environmental credentials. Of equal importance to the Campaign is the preservation of sustainable practices on farms for the benefit of the rural community.

Consequently, fashion designers and retailers are asking textile manufacturers ever more searching questions about provenance, origin and sustainability. Sustainability along the supply chain from farm to fashion is an increasingly important element in areas relating to Corporate Social Responsibility (CSR).

IWTO is the recognised global authority for manufacturing standards in the wool textile industry and we are fully aware that we are working in an area where wool's environmental credentials need to be transparent at all stages in the pipeline. Wool's Life Cycle Analysis (LCA) is very much part of this process. The route from farm to fashion crosses many borders where standards of manufacturing excellence and Corporate Social Responsibility need to respond to the expectations of increasingly vigilant consumers.

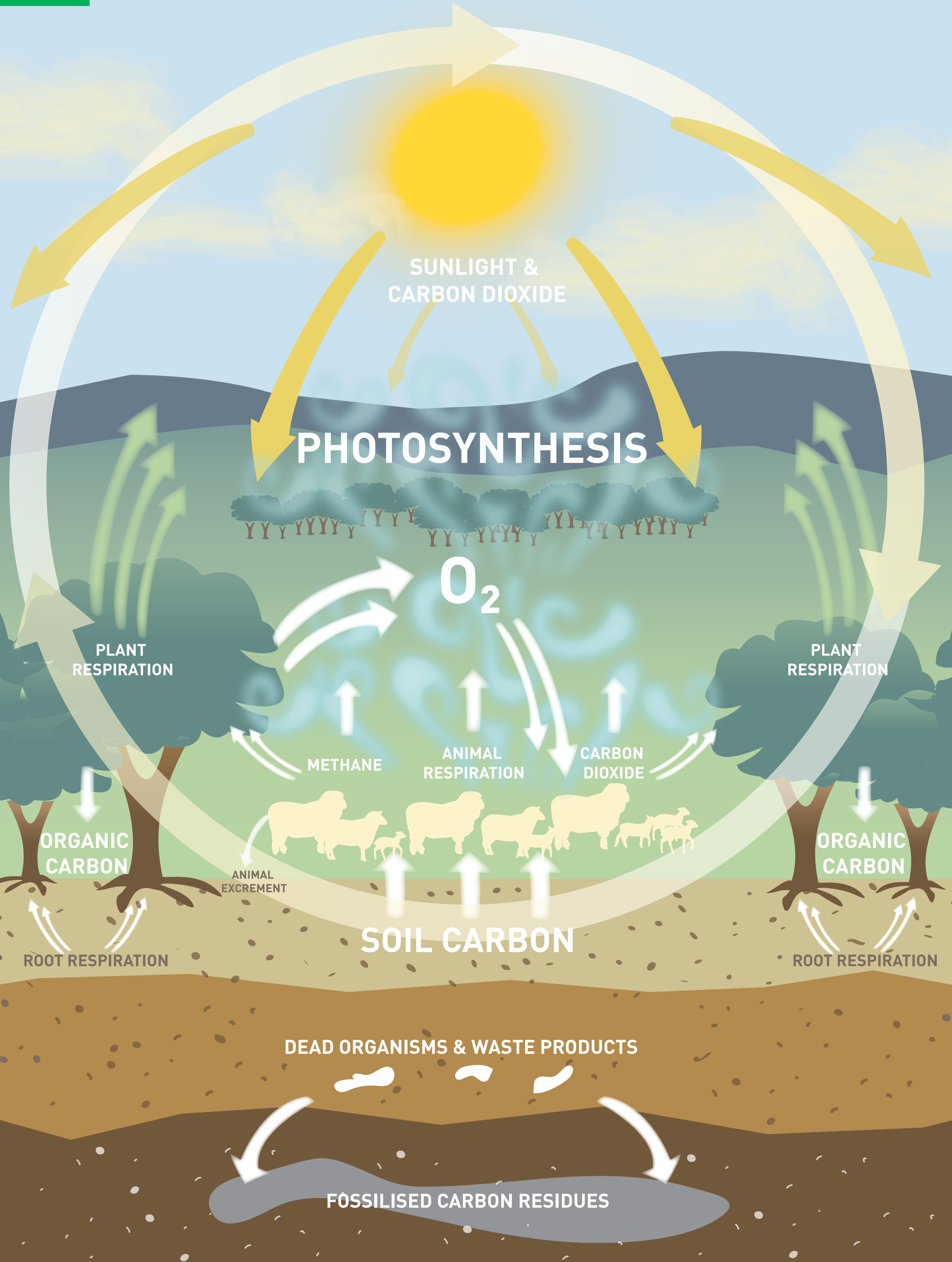
Facts

- Pure organic carbon makes up 50% of the weight of wool, higher than cotton (40%) or wood pulp–derived regenerated cellulosic such as viscose (24%).
- Converted into CO_2 equivalents (CO_2-e), 1 kg of clean wool equates to 1.8 kilograms of CO_2-e stored in a durable, wearable form.
- Extending this concept, the global wool clip represents around 1.05 million tons of clean wool which equals to 1.9 million tons of CO_2-e, or 525,000 T of pure, atmosphere-derived carbon
- Wool is readily biodegradable, unlike most synthetic fibres , and wool clothing and processing wastes are routinely recycled into other durable forms of textile (woollen-spun knitwear, insulation, geotextiles).
- The carbon in wool is derived from carbon from the pasture – and thus sequestered from the current atmosphere.

    1. Wool is produced in extensive pasture systems, where the diet is dominated by grasses and herbs. These plants convert CO_2 from the atmosphere into organic compounds using light energy - as part of the photosynthesis process which underpins most life on earth.
    2. Thus, when you purchase a wool garment, you are purchasing carbon sequestered from the atmosphere 1 – 2 years earlier.

- By comparison, the carbon in the major synthetic apparel fibres such as polyester or acrylic is extracted from fossil fuels (de-sequestering carbon originally stored millions of years ago).

CONTEMPORARY ATMOSPHERIC CYLE



The Carbon Cycle

Sheep are part of the natural carbon cycle and this cycle helps to explain how the greenhouse gas emitted from sheep fit within the natural ecosystem.

1. The atmosphere, oceans and the land systems are major stores of carbon and the movement of carbon between these stores is called the carbon cycle.
2. Carbon exists in the atmosphere mostly as carbon dioxide which can be taken up by plants in the process of photosynthesis and converted to organic carbon.
3. Organic carbon is stored in plants and soil and grazing sheep and other animals consume plants and obtain the energy in organic carbon compounds.
4. Most of the organic carbon consumed by sheep is rapidly returned to the atmosphere as carbon dioxide through respiration and eventually decay, but a small amount (around 10%) is converted to methane gas in the sheep's digestive process.
5. In the atmosphere, methane is gradually broken down to carbon dioxide which is again available to be taken up by plants in photosynthesis thus completing the cycle between the land and the atmosphere.
6. While in the atmosphere, carbon dioxide and methane trap heat and are therefore called greenhouse gases with methane being about 25 times as strong a greenhouse gas as carbon dioxide; the amount of greenhouse gases in the atmosphere has increased over the past 250 years largely due to burning of the carbon stored in fossil fuels and this has changed the natural balance in the carbon cycle and increased the greenhouse warming responsible for climate change.
7. Farmers around the world contribute to the natural carbon cycle by influencing the amount of carbon stored in plants and soils and by managing agricultural animals with food and fibre products being essential for humans who also form part of the natural carbon cycle. Good management practices can increase the carbon stored in pastures and agricultural soils and thus make a positive contribution to mitigating climate change.

CASE STUDY: spinnig Südwolle Group

SÜDWOLLE Group, in partnership with other supply chain partners engaged international environmental consultants, PE International to carry out a cradle to factory gate Life Cycle Assessment (LCA) of yarn, specific to hiking socks, and the production of a 100% Merino 200g/m single knit jersey. This involved a deep assessment of two key processes undertaken by Südwolle Group, specifically, top dyeing and spinning. Four impact categories were assessed in the study: Global Warming Potential, Eutrophication Potential (water quality), Primary Energy Demand and Water Consumption. Over all of the categories, spinning has one of the lowest impacts. Electricity consumption is the main contributor to the impact of this process as a result of the use of non-renewable energy sources. This therefore validates and highlights the importance of our ongoing investment in alternative energy sources for our mills, such as the use of photovoltaic panels.

Life Cycle Assessment (LCA) is a tool used to understand the environmental impacts associated with the production of a given product, and assesses all the input and output of a supply chain.

Life Cycle Assessment

WHY IS THE WORK ON LIFE CYCLE ASSESSMENT SO IMPORTANT?

Life Cycle Assessment (LCA) methods are used to evaluate the life cycle environmental footprint of products, such as wool apparel or interiors. The results of the study provides farmers and manufacturers with information to reduce life cycle environmental impacts. The study also informs consumers of the impacts such as greenhouse gas emissions associated with the product. Additionally, companies use the results of these studies to make operating, manufacturing and supply chain decisions towards sustainable improvements in efficiency or carbon offsets.

Life Cycle Assessments are crucial in presenting wool's environmentally strong position. These provide a baseline measurement of environmental impacts and will help identify areas for improvement. The wool industry's goal is to show wool's excellent contribution to environmentally sustainable practices, and life cycle assessments will provide us with the tools to achieve that goal.

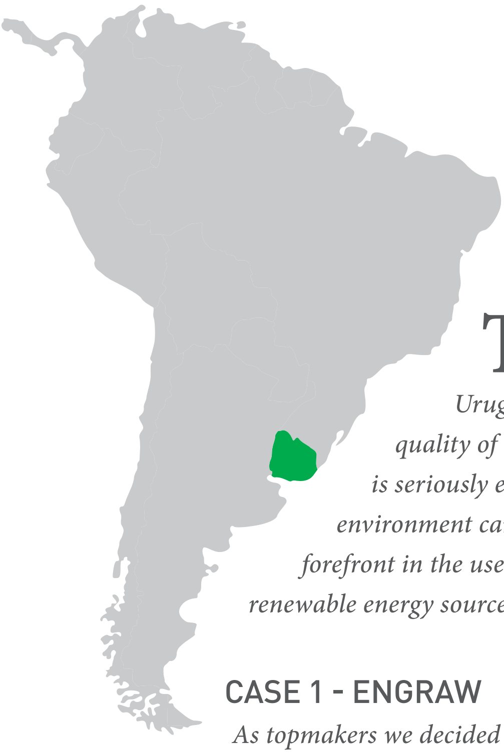
WHAT IS THE SITUATION?

Within the wool industry several Life Cycle Assessments have been completed to determine the environmental impact of its products' life cycle. An initiative between IWTO and AWI, led by Dr. Beverley Henry, brought the majority of these LCAs together. The next steps will be to fill in gaps in the data and create a realistic template and data for wool's impact on the planet.

The system shows, on the one hand, best practices and the positive impact of wool and livestock on the life cycle analysis of apparel and interior design; on the other hand it provides guidelines to improve the business to an even higher standard.

WHY LCA MATTERS TO YOU!

With its positive environmental credentials, wool can make an important contribution towards a sustainable future. In order to accomplish this, IWTO's objective is to further promote wool's environmental strengths. LCA will play a critical role in these activities, but this can only be done in collaboration with its stakeholders. From farmer to industry, from manufacturer to designer, from government to end user; all bodies involved have a positive influence on the analysis and usage of wool. That's the power of the industry.



CASE STUDY: wool combing mills in Uruguay

THE wooltops industry in Uruguay, besides the quality of their products, is seriously engaged with the environment care and is at the forefront in the use of clean and renewable energy sources.

CASE 1 - ENGRAW

As topmakers we decided to include further 'green and sustainable' actions into our production process in order to be prepared for the ongoing and expanding eco-trend. In this sense we use eucalyptus wood to generate steam and a Vestas 1.8 MW wind turbine to produce our electricity. Therefore 94% of the energy used to produce our tops comes from renewable sources.

CASE 2 – TOPS FRAY MARCOS

In order to replace the use of fossil-fuel for processing wools, TFM had recently installed a 1.8 MW wind mill to generate tops and scoured wools from clean and renewable energy (wind energy and eucalyptus wood).

CASE 3 – LANAS TRINIDAD

Lanas Trinidad has built a special anaerobic covered lagoon to capture biogas from the wastewaters treatment. At present, biogas is burnt into a flare, reducing by 95 % the emission of greenhouse gases. In a further stage, biogas will be burnt into a motor–generator to produce clean and renewable electricity from waste.'

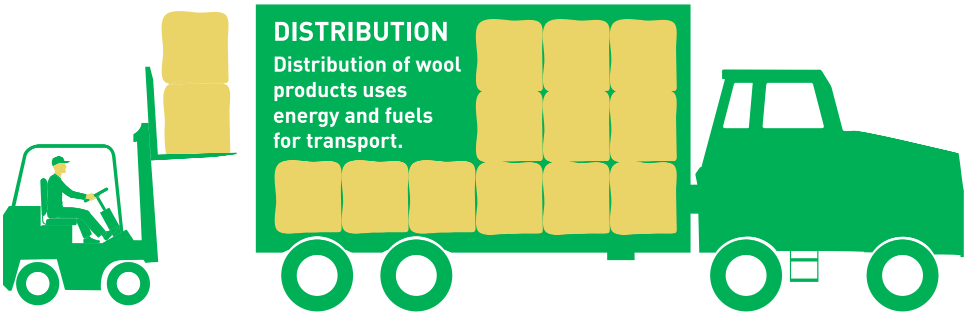
WOOL'S LCA

PRODUCTION

Wool production begins on farms where sheep graze pastures or consume imported feed. Other inputs may include farm machinery, fertilisers, veterinary chemicals, housing and bedding. On-farm environmental impacts include use of land, water and energy, emissions of GHGs and management of carbon stored in vegetation and soils.

PROCESSING

Wool processing uses chemicals, energy, water and uses fuels for transport.



DISTRIBUTION

Distribution of wool products uses energy and fuels for transport.

USAGE AND RECYCLING

The use phase of wool products requires detergent and water for laundry and dry cleaning chemicals; many wool products are re-cycled.

END-OF-LIFE

Disposal of wool products such as apparel or carpets may be to land-fill or as input for products such as fire retardants.

CASE STUDY: wool grower John & Robyn Ive, Australia

JOHN Ive and his wife Robyn produce 12-14 micron Ultrafine Merino wool and Angus beef cattle on their 250-hectare property, 'Talaheni' (which means 'wait-a-while'), located 40 kilometers north of Canberra, in NSW's Southern Tablelands. For the Ives, the dual challenges of producing some of the world's finest wool in a region of highly variable rainfall and widespread soil salinity led them to develop an innovative farm management system, now widely recognized.

When the Ives purchased 'Talaheni' in 1980, the property was suffering major dryland salinity along with soil fertility and erosion problems. The couple developed a comprehensive plan to repair the land and rebuild farm profitability, focusing on strategic paddock re-design, planned grazing strategies to address fodder supply and improve drought resilience, targeted re-vegetation to manage soil salinity and elevated water tables, and detailed environmental monitoring systems. Outcomes from their patient investment include:

- *Increasing the number of paddocks six-fold, allowing up to 75% of the property to be rested from grazing at any time;*
- *Establishing over 200,000 native trees over 30 years, re-vegetating previously bare hilltops and simultaneously regaining the productive grazing capacity of the flats by lowering water table levels and overcoming saline seepage;*
- *Increased biodiversity while increasing the quality and quantity of feed production, and quadrupling 'Talaheni' soil carbon levels;*
- *Increasing stock carrying capacity by 4.5 DSE/Ha over 30 years;*
- *Achieving ISO14001 accreditation for their Environmental Management System.*

John and Robyn have received some 30 awards for farming achievements over the past 30 years, including most recently Australian National Carbon Cockie of the Year, in 2011.

CASE STUDY: weaving Bulmer & Lumb, United Kingdom

BULMER and Lumb Group have been dyeing wool since 1931. Over this period considerable changes have been made in both the chemistry and processing of the fibre. The group is committed to processing this natural fibre in the most environmentally acceptable means possible. The process used ensures energy usage and emissions to effluent are as low and environmentally tolerable as current technologies allow, whilst retaining the properties of the fibre and minimising fibre damage.

Bulmer and Lumb Group is fully compliant with the EC Directive on Integrated Pollution Prevention and Control (I.P.P.C) and is committed to ensure chemicals and dyestuffs used cause no harm through entry into the atmosphere, the watercourses or the manufacturing process. In order to achieve compliance with the requirements of this permit Bulmer and Lumb have taken part in the formulation of a Pesticides Database, Waste Reduction study and water and energy audits. This pesticides database study has taken place over two years and contains the result of over 1000 samples supplied by a number of companies in the textile sector.

Environmental considerations are of paramount importance for the organisation when considering new investments in machinery & processes. Future projects include water recycling and re-use and potentially a joint project with another company aimed at utilising the excess hot water and hot gases created through the dyeing process.

The Bulmer and Lumb Group is in a very strong position from an environmental traceability point of view as a high proportion of the groups dyed wool tops are utilised in the Group's fabrics produced by Taylor & Lodge of Huddersfield. This ensures that we can say with confidence that all these fabrics are made to the highest international standards for global consumption.

Bill Waterhouse
Group Chairman

CASE STUDY: wool grower George de Kock, South Africa

BIODIVERSITY and long term sustainability is of utmost importance to George de Kock, a 6th generation wool and grain farmer from the Caledon area in South Africa. This is quite evident when one sees his natural pastures with Fynbos, and the verges alongside the roads. Keeping the 2 500 hectare piece of farmland's natural feel in turn promotes nature conservation. Reducing the carbon footprint of his operation is an integral part of the farming methods employed by George.

George implements the minimum tilling method for his soil, which means that he uses no fertiliser on his legumes pastures such as lucerne and clovers and that he rotates regularly between pastures and crops. Minimum tilling has carbon sequestration potential through the storage of organic matter in the top soil of crop fields.

By implementing the minimum tilling method, crop residues decompose where they fall, and by growing winter cover crops, carbon loss can be slowed and eventually reversed. In addition to keeping carbon in the soil, minimum tilling farming reduces nitrous oxide (a potent greenhouse gas) emissions by 40 to 70 per cent and in turn also increases the moisture levels of the soil.

Through minimum tilling, George has decreased his diesel consumption by 40 per cent. He has also reduced the amount of nitrogen fertilisers on his grain by 30 per cent whilst increasing grain yields by 20 per cent. George calculates that by making use of this method, he captures approximately 3 tons carbon per hectare per year in the soil, and by grazing between 2 and 3 Merino ewes per hectare farm close to 1 ton carbon is captured per year per ewe.

Therefore for every kilogram wool sheared, 150kg carbon is captured from the atmosphere into the soil per year.

The social impact of farming for George is just as important as the environmental impact. George houses eleven families on his farm, donated land for a school on the farm and his wife, Marinda also provides pre-primary schooling to the young children on the farm.

Wool Life Cycle Assessment Technical Advisory Group

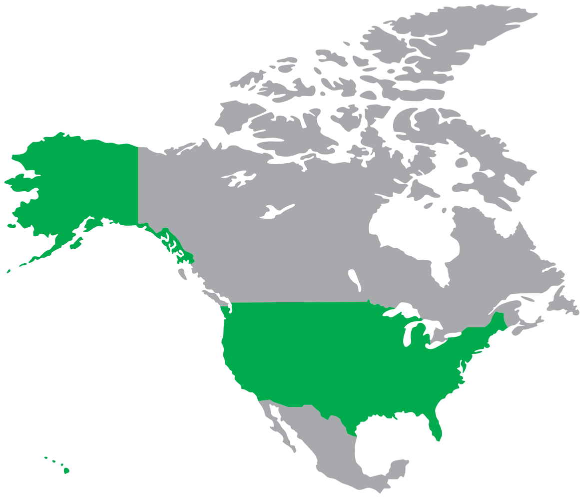
The Wool LCA Technical Advisory Group (TAG) brings together experts in Life Cycle Assessment (LCA) from across the world to provide a technical advisory resource for IWTO's Environmental Credentials Working Group. In order for the environmental credentials of wool to be accurately and consistently reported, the Wool LCA TAG seeks to resolve several priority issues:

1. Allocation of environmental impacts between co-products in sheep production systems, e.g., what proportion of the total greenhouse gas emissions or water used on-farm should be attributed to wool and how much to other products such as meat, milk and skins;
2. Collating the best available data and identifying any gaps to allow for more accurate LCA results;
3. Developing an agreed set of guidelines so that wool LCAs are based on consistent methods;
4. Building regional capacity so that key wool producing areas have better data and LCA expertise;
5. Engaging with industry, NGOs and scientific researchers to share technical improvements and LCA results.

The work of the Wool LCA TAG was initiated with a meeting in Australia in April 2013, and research has begun on these priorities.

CASE STUDY: scouring New Zealand Wool Services (WSI), New Zealand

At New Zealand Wool Services International Limited (WSI) we believe in wool's natural qualities and want to ensure that our production has a minimal impact on the environment. Over the past five years we have undertaken a number of upgrades at our Kaputone scour to lift the quality of wastewater discharged. As a result, effluent from Kaputone is 30 to 50 times cleaner. Water usage has been reduced by 90 percent, waste is recycled with mud extract going to composting. Residue detergent and chemicals are extracted and made inert with the water cleaned and recycle. The aim is to extract and reuse all components and continually reduce discharge levels for the betterment of the environment.



CASE STUDY: wool grower
Ben and Jamie Lehfeldt, USA

FIELD TO FABRICATION

For more than 100 years, five generations of the Lehfeldt family have raised Rambouillet sheep, a breed known for its ultra fine wool. In addition to raising and caring for their sheep, the Lehfeldts are stewards of their land in a tiny town in central Montana. Tradition, heritage and a genuine devotion to their sheep and a commitment to the land led wool clothing manufacturer, Ibex, to select the Lehfeldts' Rambouillet wool as the source for one of its outdoor wool clothing lines.

The Lehfeldts pioneered and implemented targeted grazing in their operation and see it as a real opportunity for the industry. When knapweed infestation levels are relatively high, the forb component of the landscape virtually disappears. As sheep grazing continues, forbs and grasses begin to reclaim areas once dominated by this invasive weed. Because river corridors are especially sensitive to chemical treatment of invasive weeds, sheep grazing can provide an environmental friendly control solution. The spotted knapweed infestation went from 67 percent of the forage production in 2004 to 8 percent in 2007, all while the percentage of grass increased from 25 percent to 63 percent.

The Working Groups

IWTO members around the world are actively participating on the work of updating wool's environmental credentials:

ENVIORNMENTAL CREDENTIALS/LCA WORKING GROUP

- Dr Paul Swan (Australia)
- Elisabeth van Delden (Belgium)
- Huang Shuyuan (China)
- Günther Beier (Germany)
- Rudolph de Jong (The Netherlands)
- Stephen Fookes (New Zealand)
- Dave Maslen (New Zealand)
- Geoff Kingwill (South Africa)
- Ian Hartley (United Kingdom)
- Peter Ackroyd (United Kingdom)
- Ignacio Abella (Uruguay),
- Peter Orwick (USA)
- Rita Kourlis Samuelson (USA)

LCA TECHNICAL ADVISORY GROUP

- Dr Beverley Henry (Australia)
- Dr Paul Swan (Australia)
- Dr Stephen Wiedemann (Australia)
- Prof Ding Xuemei (China)
- Dr Stewart Ledgard (New Zealand)
- Dave Maslen (New Zealand)
- Dr Barbara Nebel (New Zealand)
- Dr Steve Ranford (Nea Zealand)
- Prof Stephen Russell (UK)
- Rudolph de Jong (The Netherlands)

Budget

- The Environmental Credentials/LCA project is co-funded by IWTO members
- Australian Wool Innovation (AWI) matches funding contributed by IWTO members up to a certain level
- Momentarily a total of six grower countries have contributed funding
    1. Australia through AWI
    2. New Zealand
    3. South Africa
    4. United Kingdom
    5. Uruguay
    6. USA
- Funding is based on the following principles:
    1. full transparency towards and between all funders
    2. predictability for IWTO and the Environmental Credentials Coordinator (2 year funding)
    3. maximizing leverage of funds (involve as many countries as possible; maximize AWI co-funding)
- Further AWI funding would be available if matched by other IWTO members
- Funding is needed for research, communication including external stakeholder engagement

CASE STUDY: wool grower Ricardo Fenton, Patagonia

NATURE IS INCREDIBLY GOOD WHEN YOU WORK WITH HER

HOW *Patagonia's Ranchers are Using Nature to Protect their Environment and Way of Life.*

For five generations Ricardo Fenton's family has raised sheep in the legendary windswept steppes of southern Patagonia. For long years, it seemed that these vast plains would maintain this way of life forever. But overgrazing, along with climatic conditions, was fast turning these grasslands to desert.

Ricardo was seeing how despite his best efforts, his beloved land was taking longer and longer to recover from droughts: "We were applying the best of range science on the farm, but we were just managing it, not improving it." It soon became clear to Ricardo that this ranching heritage would probably not pass on to his grandchildren.

At this point, Ricardo, his father and his children decided to turn their 65,000 -acre ranch, Estancia Monte Dinero, into a living laboratory to test how changing the ways they graze and manage their animals might provide a solution.

The Fenton family seized their opportunity when Argentine ranchers' network OVIS XXI, The Nature Conservancy, and outdoors clothing company Patagonia Inc., launched a pioneering collaboration in December 2010 to protect and restore Patagonia's grasslands. Their Grasslands Regeneration and Sustainability Standard (GRASS) protocol incorporates a whole-system approach into traditional grazing practices: When flock and herd sizes, lands and streams are properly managed, then ranchers, sheep, cattle, native plants and animals can thrive together.

Today, Ricardo and his family are learning that by imitating the grazing patterns of migrating native animals, the grasslands can rebound. The science-based GRASS standards are certifying the sustainability of wool from ranchers like Ricardo. At the same time, the partnership is building global markets for sustainable wool. Now consumers can literally help to support the recovery of Patagonia's grasslands and similarly threatened grasslands around the world.

Ricardo is already seeing the first outcomes on the family ranch. "This project is very exciting because it takes sheep which in continuous grazing were having a bad effect on the grasslands, and turns them into a tool to regenerate these lands. We are now breeding easy-care sheep the way nature wants them, to produce high-quality wool that's very much like cashmere. Nature is incredibly good when you work with her."

Definitions

ALLOCATION
The sharing of the inputs of a production system (including a farm) between co-products and the term used for dividing the impacts of the system between the co-products. For example, inputs to a sheep farm such as fuel and fertilizer may be split between sheep and grain produced on the farm; the impacts of sheep such as greenhouse gas emissions are partitioned between the various co-products such as wool, sheep meat, milk, skins, lanolin.

CARBON FOOTPRINT OR CARBON FOOTPRINT OF A PRODUCT
The sum of greenhouse gas emissions and greenhouse gas removals of a product system.

CARBON DIOXIDE
The most important greenhouse gas produced by human activities, especially the burning of fossil fuels.

CO_2-E – CARBON DIOXIDE EQUIVALENT
The unit for comparing the radiative forcing of a greenhouse gas to that of carbon dioxide unit for expressing the combined global warming impact of different greenhouse gases using their different ability to trap heat at the earth's surface.

GHG – GREENHOUSE GAS
The gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the earth's surface, the atmosphere, and clouds gas in the atmosphere; it absorbs and re-emits radiation from the sun causing the earth's surface to warm.

LIFE CYCLE
The consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal [ISO 14044:2006]; all stages of a product system or supply chain from raw materials to final disposal or recycling.

LCA – LIFE CYCLE ASSESSMENT
The compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14044:2006]; a technique or tool to assess environmental impacts associated with all the stages of a product's life from-'cradle-to-grave'.

N_2O – NITROUS OXIDE
A strong greenhouse gas with a global warming potential of 298 times that of carbon dioxide, which is released to the atmosphere as a result of nitrogenous fertiliser applications or from animal waste (dung and urine).

METHANE
A strong greenhouse gas produced in some industrial processes and from the digestive system of ruminant animals such as sheep and cattle. Methane is 25 times as strong a greenhouse gas as carbon dioxide.

CASE STUDY: recycling John Cotton Nonwovens

*J**OHN** Cotton Nonwovens is actively committed to eliminating textiles and plastics from entering our landfills when they can be recycled or reused for a second life.*

The company has been recycling end of life textile waste in the form of used clothing for over fifty years and now recycle more than half a million garments every week by mechanically recycling post-consumer knitwear and loosely woven fabrics to produce an important industrial raw material known as shoddy.

This fibrous raw material is then converted in to high loft nonwovens by mechanically bonding (needlepunching) or thermally bonding blends of natural, recycled and synthetic fibres to create fabrics that are specifically tailored for a diversity of industrial uses, including mattress, furniture and automotive components. Recycled fibres are therefore given a second service life that can extend in to many years.

Post-consumer wool clothing is an important raw material for a variety of industrial product applications. At present, the Company recycles about forty to fifty tonnes of wool clothing per week. Most of this clothing comes from Oxfam and other charitable organisations and is sorted at the company's facilities. The clothing is separated into wool blends and cotton. About 30-40 % of this comprises wool blends. After sorting, the clothing is mechanically broken down in to fibre form and is then processed by heavy-duty pickers. After additional processing steps, the recycled fibre is converted in to high density nonwoven fabrics that are formed between cold calendar rollers before being prepared for despatch to the customer.'

"I see farmers as custodians. You're there to give it to the next generation or to enhance it. If my grandfather could see what we've done out here, he just wouldn't be able to believe it. And I think we've left it in a better place.

It'll be great when the connection happens for the general public, realising that farmers manage the land and animals looking at long-term viability and how we want to manage it for the next generation. It's in our best interests to manage for the next year and year after. If we take too much out of it this year, we won't be able to work with the land next year. It's all a balance.

But farmers don't feel compelled to tell everyone that, anyway—they just sort of get on with it, I suppose."

James Walker

'Camden Park' and 'Wakefield'
Central Queensland, Australia

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