PULSE CANADA

CANADIAN LENTILS

LIFE CYCLE ASSESSMENT SUMMARY REPORT

CANADIAN PULSES

Canadian pulses are an increasingly popular source of plant-based protein. Pulses are high in protein, fibre, vitamins and minerals but generally low in fat. The climate of the Canadian prairies is ideally suited for pulse production, making Canada one of the world's largest producers and exporters of pulses and pulse ingredients.

Pulses are considered to be environmentally beneficial foods, with research suggesting that Canadian pulse production has relatively low environmental impacts. Pulses benefit cropping systems when included in crop rotations. These benefits include increased soil organic carbon (SOC) levels as well as reduced fertilizer inputs, corresponding to reduced greenhouse gas emissions. However, as sustainability becomes a critical driver of food product formulation and corporate social responsibility goals, there is a need to generate standardized, robust and in-depth data for food crops across geographical origins and production systems.

Life cycle assessment (LCA) is a widely utilized approach to quantify resource inputs (e.g., energy/fuels, water) and emissions (e.g., GHGs, air pollutants) across the entire life cycle of a product or service. LCA offers insights into the sustainability of a product that can improve product design or production practices, reduce resource use, inform stakeholders on environmental performance, and support evidence-based policy and management decisions.
In order to improve understanding of the environmental impacts of whole pulses and pulse ingredients in food systems in Canada, Pulse Canada engaged the Priority Research for Integrated Sustainability Management (PRISM) Laboratory at the University of British Columbia (Okanagan) to undertake and report the life cycle assessment for Canadian lentils.

METHODOLOGY

Regionalized data inventories were developed and used to perform regionalised LCAs for Canadian lentils at the ecozone, provincial and Prairie province scales.

The study followed the ISO 14040/14044 (ISO 2006) standards for life cycle assessment, with the following specific goals:

1. To develop ISO 14044-compliant regionalized (i.e., at ecozone, province, and prairie provinces scale) life cycle inventories for lentil production in the Canadian Prairie Provinces (i.e., Alberta, Saskatchewan, and Manitoba).

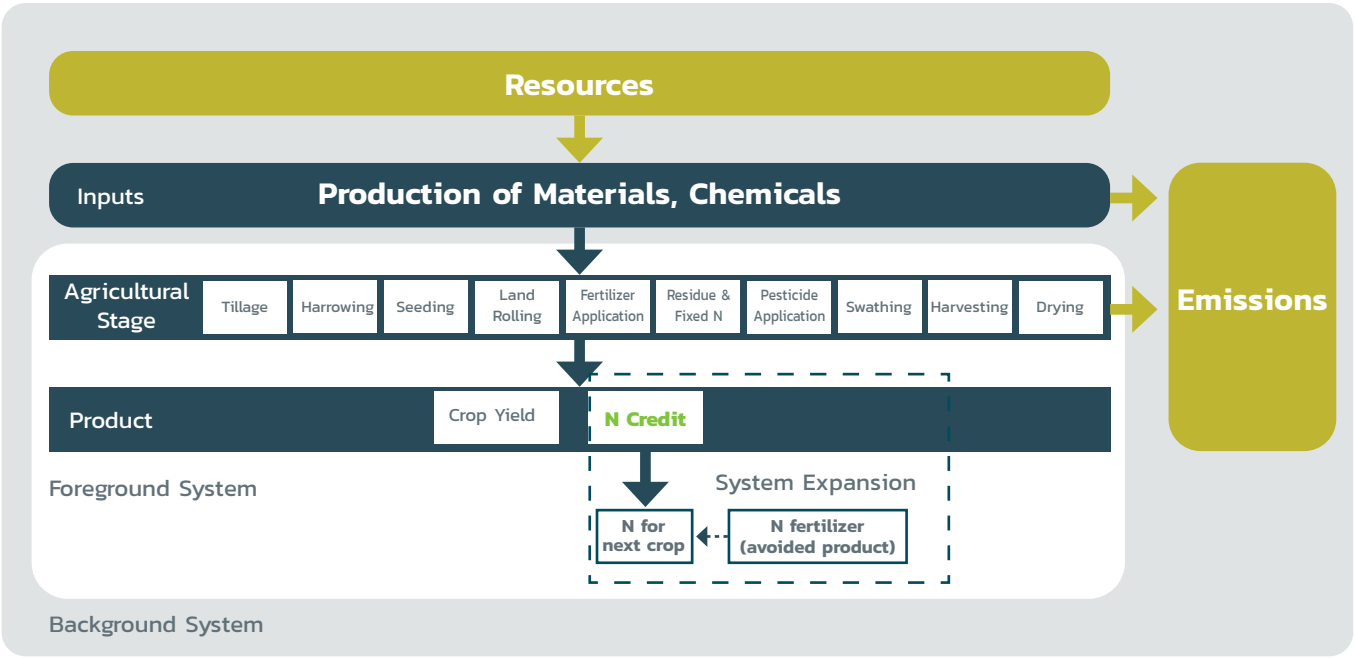
2. To perform ISO 14044-compliant LCAs in order to quantify the resource and environmental impacts of lentil production, using regionally-resolved, temporally and technologically current data.

Regionalized data directly from Canadian growers

287 Canadian lentil farmers were surveyed to collect detailed data regarding characteristic farm inputs, yields and management practices at the reconciliation unit level of spatial resolution, which reconciles Canadian provincial borders with terrestrial ecozones based on soil and climate factors.

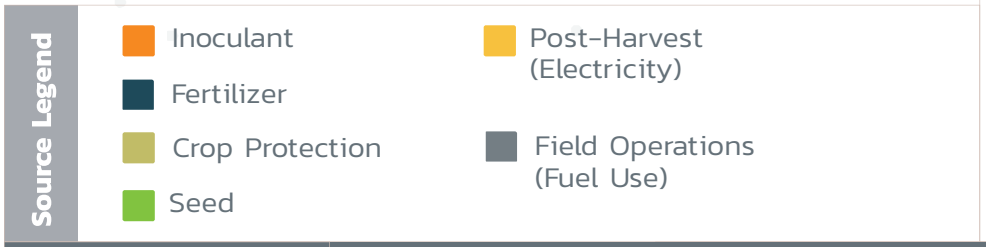
The figure below shows a flow diagram of the supply chain processes included in the life cycle inventory (LCI) of lentil production. The light grey box represents the foreground system, which includes the farm-level data that were collected directly from farmers. The background data came from third-party LCI databases such as ecoinvent.

The LCA includes emissions from products manufactured off the farm, including fertilizers, pesticides and fuel, which are all considered part of the 'background system'. The LCA also encompasses practices on the farm, or the 'foreground system', including field operations like seeding, harvesting, pest management, and the decomposition of crop residues. Crop yield, and the nitrogen credit of pulses that benefit the following crop are also included and considered in the 'foreground system'.

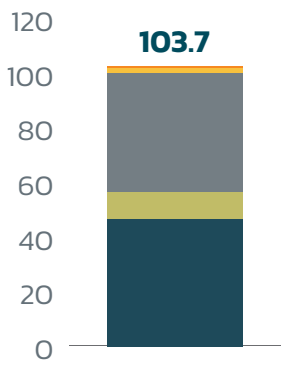


RESULTS

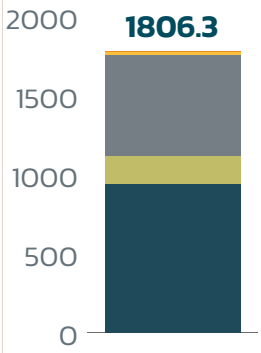
Average values across prairies are presented per tonne of lentils. For a more detailed breakdown by region/ecozone, please contact us at **sustainability@pulsecanada.com.**



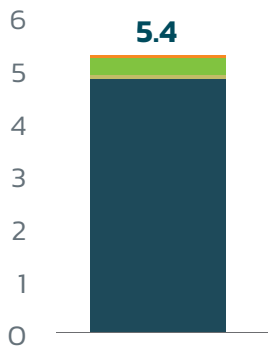
Climate Change
(kg CO_2 eq/tonne)



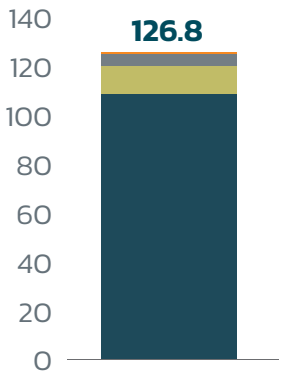
Fossil/Nuclear Energy
(MJ deprived)



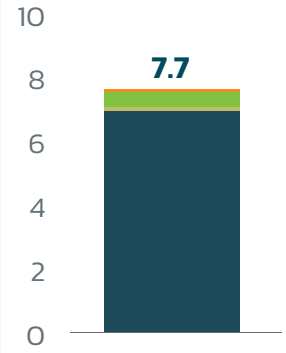
Biodiversity Impacts
(PDF.m².year)



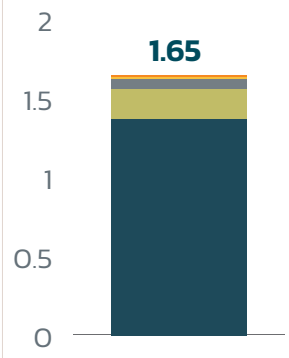
Water Scarcity
(m^3 world-eq)



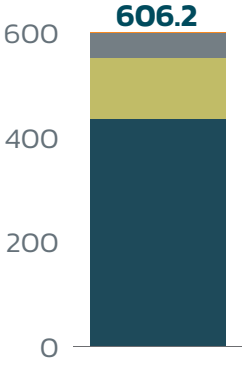
Land Occupation
(m^2 arable land eq/year)



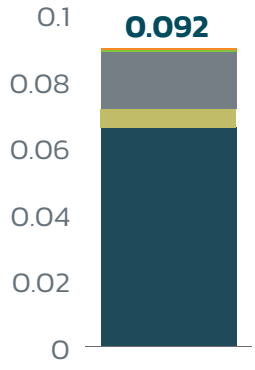
Mineral Resources Use
(kg deprived)



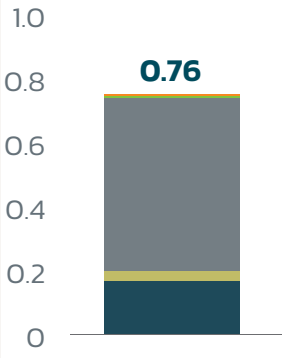
Ionizing Radiation
(Bq C-14 eq)



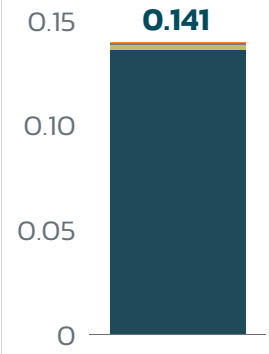
Particulate Matter Formation
(kg PM2.5 eq)



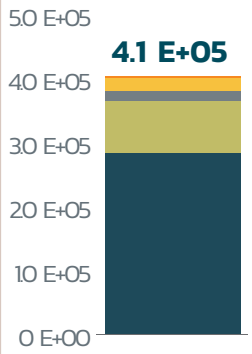
Photochemical Oxidant Formation
(kg NMVOC eq)



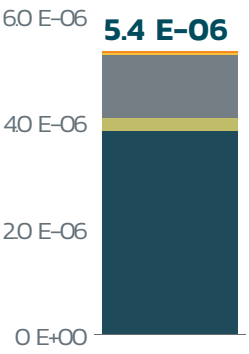
Freshwater Eutrophication
(kg PO_4 P-lim eq)



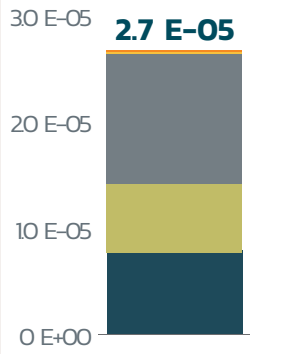
Freshwater Ecotoxicity
(CTUe)



Terrestrial Acidification
(kg SO_2 eq)



Ozone Layer Depletion
(kg CFC-11 eq)



CONCLUSION

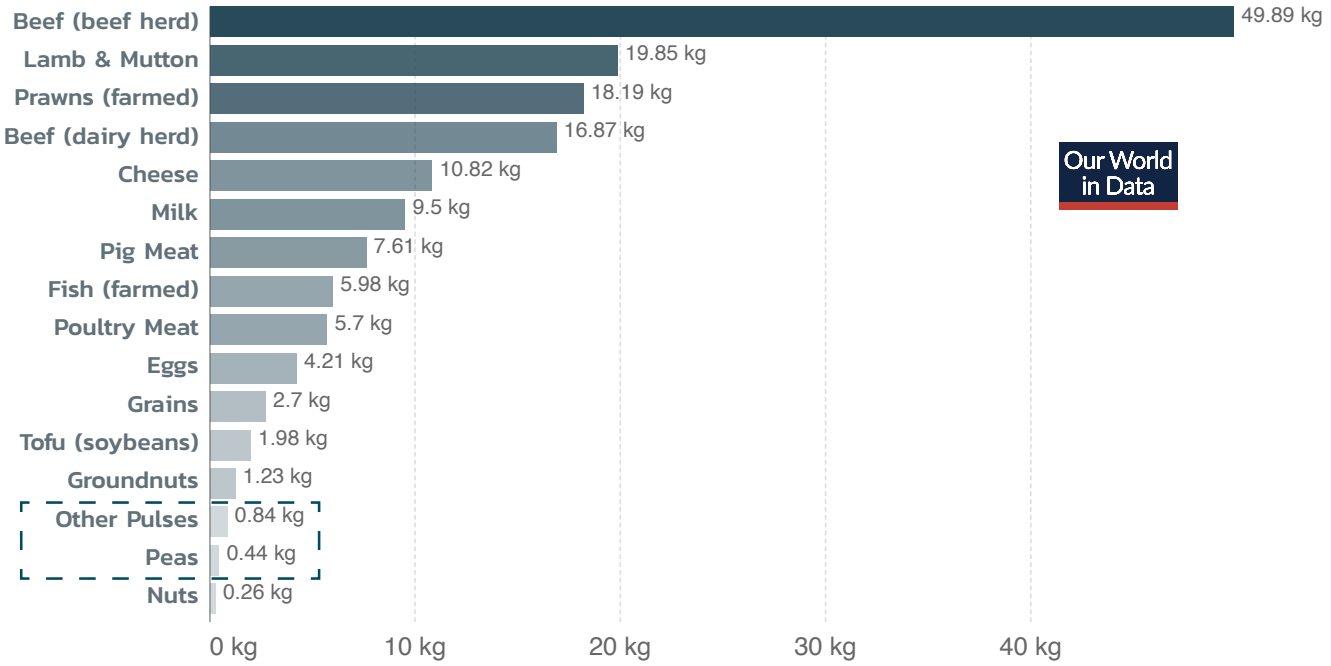
Based on the cradle-to-farm gate life cycle environmental assessment of Canadian lentils, the main contributors to the impacts of production were fertilizer and fuel use.. While some variation exists across regions and ecozones, the LCA confirmed the relatively low environmental impact of Canadian pulses.

COMPARING FOOTPRINTS

Direct comparisons of the environmental impact between foods and ingredients is difficult, as there are many influencing factors such as specific production practices, geographic impacts and, importantly, the methodology behind the stated footprints. However, it's well established that pulses have a very low carbon footprint relative to other foods.

AVERAGE GREENHOUSE GAS EMISSIONS PER 100 GRAMS PROTEIN

Greenhouse gas emissions are measured in kilograms of carbon dioxide equivalents ($kgCO_2$ eq) per 100 grams of protein. This means non-CO_2 greenhouse gases are included and weighted by their relative warming impact.



Source: Poore, J., & Nemecek, T. (2018). Additional calculations by Our World in Data. Note: Data represents the global average greenhouse gas emissions of food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries. OurWorldInData.org/environmental-impacts-of-food

A strong sustainability story starts with strong data

When formulating a product for sustainability, it's critical to look beyond global average values. Ensure that detailed and robust data is in place, such as a Life Cycle Assesment, to adequately assess the specific production system and geographic location the ingredient is being sourced from.

Questions? We're ready to help.
sustainability@pulsecanada.com
www.pulsecanada.com/sustainability

PULSE CANADA