

Roundtable Report

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Background

The agriculture sector and LCA community in Australia desire that soil function and qualities be captured in national inventory. The Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) is to commence a project with this aim, as part of a New South Wales Department of Primary Industry (NSW DPI) project 'Identifying national opportunities for grains emissions mitigation and other environmental improvements, using life cycle assessment (LCA) and the AusAgLCI inventory', to be funded by the Australian Grains Research and Development Corporation (GRDC).

This project follows on from a prior program of work completed in 2013 to establish a national life cycle inventory (LCI) dataset for Australian agricultural processes (AusAgLCI) which is available within the Australian Life Cycle Inventory (AusLCI) database (alcas.asn.au/AusLCI). The developed data sets currently contain inventory that allows for the assessment of resource depletion, global warming, eutrophication, acidification, and human- and eco-toxicity. The current project aims to extend the inventory to enable the assessment of soil-related impacts.

This report provides a brief summary of a Roundtable which was held to lay some groundwork for the project. The ideas developed from the discussions have been further developed in a poster paper submitted to the LCAFood 2014 Conference, San Francisco, October 2014.

Roundtable details

The Australian Life Cycle Assessment Society (ALCAS) hosted the Roundtable and Webinar. It was held over 2 days in Canberra and brought together around 50 soil scientists, LCA researchers, and government and research investment managers (25 in person and 25 by webinar). The event was made possible through the sponsorship of the GRDC.

The aim was to connect LCA researcher with Australian soil scientists, for the purpose of reviewing the latest science related to soil processes in Australia and considering how best to characterise soil-related impacts in LCA in the Australian context. An invited international speaker, Dr. Miguel Branão, currently at Massey University in New Zealand, participated in the Roundtable by providing an update on international developments in land use impact assessment, which he has been instrumental in developing.

After some introductory sessions on LCA and international developments in land use impact assessment, the forum heard from prominent Australian soil scientists about notable soil characterization developments in Australia. The forum also connected via webinar with overseas LCA researchers (from Europe, North America and New Zealand) to gain insights into international developments and interest in this field.

Roundtable outcomes

The soil issues covered in the workshop were those for which there is active and significant research taking place in Australia - compaction, soil organic carbon, erosion, contamination, soil biota and acidification. While not covered in the structured presentations, the additional issues of soil salinization and structural decline were also discussed.

From the discussion it was possible to i) nominate the soil function and quality parameters of most importance and relevance for Australia, ii) propose how soil-related indicators of interest in Australia can align with evolving impact assessment frameworks, and iii) identify how Australian spatial datasets can be utilised to generate LCI for soil-related flows to allow for more regionally-specific assessment of soil-related impacts. The discussions that took place, which are summarised briefly below, will guide the further investigation of the CSIRO project.

Priority soil function and quality parameters for Australia

Participating soil scientists were asked to rank the soil characteristics according to their environmental importance in Australia and the expected difficulty of inventory development. The results of participant feedback are shown in Figure 1.

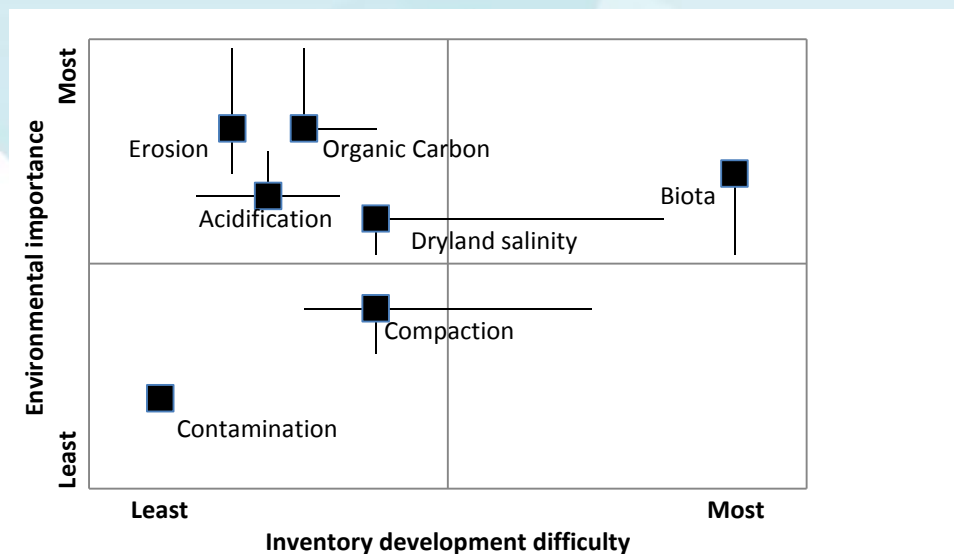


Figure 1. Ranking of environmental importance and difficulty of inventory development (with the horizontal and vertical bars indicating spread in opinion).

The set of characteristics considered to be important because they significantly influence the productivity, the soil resource base, and ecosystem services, and for which there is reasonable data available, are soil organic carbon, erosion and acidification.

Alignment with land use impact assessment frameworks

The alignment of inventory with impact assessment is an important consideration in developing regional inventory datasets. The most developed framework relating to land use are the guidelines for land use impact assessment developed under the UNEP/SETAC Life Cycle Initiative. It proposes a characterization model that links land characteristics with indicators of eco-system services.

Soil-related inventory developed for Australia for soil organic carbon and erosion could align with emerging land use impact assessment framework. Adaptation of the impact assessment framework to accommodate Australian conditions could be the inclusion soil acidity as a moderator of biomass productivity. Furthermore, including soil within resource depletion impact categories would allow for consideration of Australia's soil resource conservation objective.

Utilisation of spatial datasets to generate LCI for flows related to soil function

To enable cost effective inventory development across the breadth of Australia's agricultural regions, the development of the AusAgLCI datasets has utilized GIS-enabled spatial data. It was identified at the Roundtable that spatially-linked data for soil organic carbon, erosion and acidification are available, and it proposed that these be used to add soil-related inventory.

For extending Australian agricultural inventory, region- and production system-specific inventory flows derived from spatial data are proposed to be employed rather than defaulting to globally-generic characterization factors developed by the UNEP/SETAC program. This will give more accurate estimates of key soil impacts in the Australian context. Spatial data for soil organic carbon, and acidity (pH) already exist, and are represented as 'stocks'. The challenge will be to couple these estimates of 'stocks' with a means of estimating 'flows' (stock changes), and to link flows to management practices and interventions.

Summary

A scientific roundtable on 'soil quality Indicators in environmental life cycle assessment (LCA)' was hosted by the Australian Life Cycle Assessment Society (ALCAS) at the CSIRO Black Mountain Campus in Canberra in April 2014. It brought together around 50 soil scientists and LCA researcher from Australian and overseas to review how the latest soil science can be used to characterise soil-related impacts in Australian environmental studies. The event was made possible through conference sponsorship from GRDC.

The roundtable was able to nominate soil organic carbon, erosion and acidification as priority soil parameters for Australia. The extension of the existing agricultural LCA database (AusAgLCI) to include these soil indicators is something that will be examined further as part of a GRDC-funded DPI NSW / CSIRO project.

The involvement of an invited international speaker Dr. Miguel Branão, which was made possible through the GRDC sponsorship, was very beneficial for ensuring that Australia-specific data development efforts to come can align with internationally-recognized LCA methods.

The roundtable laid the groundwork for making Australian soil data available for environmental LCA studies. This will mean that the environmental profiling of Australian agricultural products, such as grains, can be more accurate and will allow scientists to evaluate environmental issues that are important for Australia.