

## **THE WORLD FOOD LCA DATABASE PROJECT: TOWARDS MORE ACCURATE FOOD DATASETS**

*Jens Lansche\* (1), Gérard Gaillard (1), Thomas Nemecek (1), Patrik Mouron (1), Laura Peano (2), Xavier Bengoa (2), Sébastien Humbert (2), Yves Loerincik (2)*

*(1) Agroscope Reckenholz-Tänikon Research Station ART, Reckenholzstrasse 191, 8046 Zurich, Switzerland*

*(2) Quantis, Parc scientifique EPFL, Bât. D, 1015 Lausanne, Switzerland*

\* Reckenholzstrasse 191, CH-8046 Zurich, [jens.lansche@agroscope.admin.ch](mailto:jens.lansche@agroscope.admin.ch)

*Keywords: agriculture; food processing; food eco-design; environmental product declaration; LCI.*

### **ABSTRACT**

There is an increasing demand for LCA applied to the food and beverage sector. However, major limitations in doing LCA studies in this sector are currently the lack of inventory data and processes, and the absence of consistency among existing food datasets. Several libraries of data on food already exist but most of them provide little transparency and are often incomplete, outdated or not regionalized. Therefore, there is a need to develop detailed, transparent, well-documented and reliable data in order to increase the accuracy and comparability of LCA in the food sector. This need is being addressed by the World Food LCA Database (WFLDB) project. The main aim of the WFLDB is to create a basis to assist companies and environmental authorities in processes like Environmental Product Declarations (EPD) or food eco-design, but also for academic research.

### **INTRODUCTION**

Agricultural production and food processing contribute significantly to environmental impacts on global warming, eutrophication and acidification (Pardo and Zufía 2012; Ruviano et al. 2012; Saarinen et al. 2012). In the last decade, LCA is increasingly used for the quantification of these impacts and to meet the demand for optimization of food production (Notarnicola et al. 2012).

However, major limitations to such assessments are the lack of reliable and consistent inventory data. Existing libraries of LCI data on food are most often:

- Not transparent enough
- Incomplete: only few inventory flows are accounted for, which leads to an incomplete overview of the impacts of food products and misleading interpretations and conclusions
- Inconsistent among each other, due to different approaches and assumptions

- Outdated and consequently unreliable
- Not regionalized: country-specific data are not available or the region under study is not represented

Therefore, it is critical to develop detailed, transparent, well-documented and reliable data to allow for more accurate and comparable LCA in the food sector. This need is being addressed by the World Food LCA Database (WFLDB) project. The main aim of the WFLDB is to create a basis to assist companies and environmental authorities in processes like Environmental Product Declarations (EPD), but also for academic research.

## **MATERIALS AND METHODS**

A new set of food inventory data is being developed from existing LCA studies on food products (project partners' past LCAs, Agroscope and Quantis existing databases), literature reviews, statistical databases of governments and international organizations (such as the Food and Agriculture Organization of the United Nations), environmental reports from private companies, technical reports on food and agriculture, information on production processes provided by the project partners as well as primary data. Background datasets from the ecoinvent database are being used as a basis and compatibility with ecoinvent will be ensured. The developed datasets include, when relevant, different production schemes (such as conventional, integrated or organic production), regional specificities and deforestation impact. To guarantee its transparency, the inventory database is fully documented, unit processes are visible (except for confidential data) and all sources are referenced. The end-user will be able to differentiate among different stages of the process (e.g. agricultural production vs. food product manufacturing) and to identify the main impact contributors for each dataset (e.g. pesticides, fertilizer use, etc.).

Datasets created within the project will initially be solely available to the project partners but are intended to become public later through their integration in ecoinvent. The scientific modeling principles of the WFLDB are at a first instance based on:

1. ISO standards 14040 and 14044 (ISO, 2006a; ISO 2006b)
2. ecoinvent quality guidelines (ecoinvent, 2013; Weidema et al, 2013)
3. ILCD guidelines (JRC, 2010)

The project managers apply scientific rules for modeling of the WFLDB datasets. These rules are based on the above-mentioned documents and on other existing guidelines for modeling agricultural processes. By doing this, it is ensured that all datasets within the WFLDB are modeled according to internationally accepted standards and are fully consistent with each other. Furthermore, the project managers follow the developments within other international initiatives and organizations such as The Sustainability Consortium (TSC), the Food and Agriculture Organization of the United Nations (FAO), the Sustainable Agriculture Initiative Platform (SAI), the EU Food SCP Roundtable and the EU Product Environmental Footprint. Scientific guidelines used in other database initiatives such as Agri-BALYSE (Van der Werf



## The 6th International Conference on Life Cycle Management in Gothenburg 2013

et al., 2010) and ACYVIA (Bosque et al., 2012) are also considered for the definition of the WFLDB modeling principles (developments are considered as they occur).

The aim is to be as compliant as possible with the developments occurring within these different initiatives and organizations. Compliance with other initiatives is assured by the project advisory board, which has a consultative role and is constituted of members of non-governmental organizations, research institutions and/or industrial organizations.

In conclusion, the WFLDB will be a comprehensive LCA food database providing detailed LCI data of high scientific quality, reliability and transparency on food products, while being in line with other database developments such as ecoinvent v3. The database will provide a large number of new food-related inventory datasets with a focus on different production schemes and regional specificities.

### RESULTS

The WFLDB datasets will be delivered in the most widely used data exchange formats for LCA software (i.e. ILCD, ecospold v1, ecospold v2, SimaPro-CSV, Quantis SUITE 2.0-excel). This will enable using the datasets in three of the most common LCA software: SimaPro, GaBi and Quantis SUITE 2.0.

The datasets are released in three phases, the first release occurring in the summer 2013. A selection of datasets from the first release will be presented as well as learnings obtained in the last 12 months data collection. Two years after their release to the project partners, datasets will be submitted to ecoinvent for their integration in this public database.

### REFERENCES

Bosque, F., Réthoré, O., Bortoli, H., Quantis, Gaillard, G., 2012. Acyvia: Creation of a public LCI/LCIA database of the French food industry, 8th International Conference on Life Cycle Assessment in the Agri-Food Sector. October 2-4, 2012, Saint-Malo, France.

Ecoinvent Centre, 2013. ecoinvent database v 3. [www.ecoinvent.ch](http://www.ecoinvent.ch).

European Commission, Joint Research Centre, Institute for Environment and Sustainability, 2010. International Reference Life Cycle Data System (ILCD) Handbook, General guide for Life Cycle Assessment, Detailed guidance. Publications Office of the European Union.

ISO (2006a) ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework. International Standards Organization.

ISO (2006b) ISO 14044:2006 Environmental management – life cycle assessment – requirements and guidelines. International Standards Organization.

Notarnicola, B., K. Hayashi, M. A. Curran and D. Huisingh (2012). "Progress in working towards a more sustainable agri-food industry." *Journal of Cleaner Production* 28: 1-8.

Pardo, G. and J. Zufia (2012). "Life cycle assessment of food-preservation technologies." *Journal of Cleaner Production* 28: 198-207.

Ruviaro, C. F., M. Gianezini, F. S. Brandao, C. A. Winck and H. Dewes (2012). "Life cycle assessment in Brazilian agriculture facing worldwide trends." *Journal of Cleaner Production* 28: 9-24.



## The 6th International Conference on Life Cycle Management in Gothenburg 2013

Saarinen, M., S. Kurppa, Y. Virtanen, K. Usva, J. Makela and A. Nissinen (2012). "Life cycle assessment approach to the impact of home-made, ready-to-eat and school lunches on climate and eutrophication." *Journal of Cleaner Production* 28: 177-186.

Van der Werf, HMG, Gaillard, G., Biard, Y., Koch, P., Basset-Mens, C., Gac, A., Lellahi, A., Deltour, L., 2010. Creation of a public LCA database of French agricultural raw products: Agri-BALYSE. In: *Lcafood 2010, 7th International Conference on Life Cycle Assessment in the Agri-Food Sector*. September 22–44, 2010, Bari, Italy, Notarnicola et al. (eds.), Università degli studi di Bari Aldo Moro, Bari, Italy, 439-442.

Weidema B P, Bauer C, Hirsch R, Mutel C, Nemecek T, Reinhard J, Vadenbo C O, Wernet G., 2013. Overview and methodology. Data quality guideline for the ecoinvent data-base version 3. *Ecoinvent Report 1(v3)*. St. Gallen: The ecoinvent Centre