Food PEFCRs and the need for consistent secondary databases such as Agri-footprint®

Author(s): Bart Durlinger[1], Hans Blonk[1], Jasper Scholten[1]

[1]: Blonk Consultants,Gravin Beatrixstraat 34, Gouda

E-mail contact: bart@blonkconsultants.nl

Abstract

This paper describes the food PEFCR developments so far and the technical consequences for Agri-footprint®. This is illustrated by an LCA case study on animal production, which shows the differences between the PEF compliant Cattle Model Working Group recommendations and the former allocation and emission modelling in Agri-footprint®. The future development of Agri-footprint® is to follow this same route of supporting other major sector guidelines or PCR developments, such as the development of datasets that support studies compliant to the LEAP guidelines of FAO.

1. Introduction

In April 2013 the European Commission published the Product Environmental Footprint (PEF) method. This method is a framework of general requirements and principles for LCA. The European Commission aims to develop more specific technical guidance for product groups ('category rules') and tests the development of PEFCR with several European industrial sectors.

In 2014, the second wave of 11 PEF food pilots started, which involves food product groups such as red meat, dairy, beer, wine, pasta. Blonk Consultants supports the development of three pilots (feed, beer and red meat). Since it is the goal of PEFCRs is to support the communication of the environmental performance of products, data consistency and compliance with PEFCR requirements is key.

Agri-footprint® is an LCA database that is developed with the intent to support the development of agricultural and food product (agri-food) LCAs, for a wide range of applications. This is the reason that it supports multiple allocation and emission modelling methods. The PEF pilot initiatives generate new data requirements on for example allocation. These will be implemented in future updates of Agri-footprint® to support PEF-compliant calculations. A first step of alignment of Agri-footprint® to the PEF data quality requirements is integration of the calculation approach of the Cattle Model Working Group (CMWG) in Agri-footprint® 2.0, which is scheduled to be released in Q3/Q4 of 2015. The CMWG provided specific guidance on how to allocate between co-products on the farm and slaughterhouse level, and on how to calculate specific emissions from animal husbandry (such as ammonia and nitrous oxide emissions). To show some of the implications of the implementation of CMWG calculation rules, a case study on Dutch dairy and Irish beef will be presented in this paper, where the original life cycle inventories of Agri-footprint are compared to the inventories aligned to the CMWG calculation rules.

2. Methodology

2.1. Calculation framework of Cattle model working group

The objective of the cattle model working group was to harmonize LCA PEF methodology at farm and slaughterhouse level by reaching a consensual agreement regarding:

- Allocation of upstream burdens among the outputs at farm and among outputs at slaughterhouse level,
- Models for methane emission from enteric fermentation,
- Models for emissions from manure management and
- A model for carbon sequestration/release in grassland systems.

The results of the CMWG and the methodologies are to be used as baseline approach in feed, dairy, meat, leather and pet food pilots throughout the pilot process and are described in a report [1]. Agri-footprint 2.0 contains life cycle inventories which take into account the CMWG baseline approaches (PEF compliant processes) for, Dairy farm systems in the Netherlands, Irish beef, and associated slaughterhouse processes.

The main differences between the default Agri-footprint and the CMWG baseline approaches are (1) the allocation between co-products and (2) the calculation of certain types of emissions (see Table 0-1). When the Agri-footprint approach complies with the CMWG baseline approach or uses a higher Tier level, the Agri-footprint approach has been used in the PEF compliant processes.

Topic	Agri-footprint	CMWG baseline approach
Allocation on the dairy farm	Economic/ Mass/ Gross energy content	IDF allocation
Allocation in the slaughterhouse	Economic/ Mass/ Gross energy content	Economic allocation with predefined allocation fractions
CH4 emissions due to enteric fermentation	IPCC guidelines Tier 3	IPCC guidelines minimum Tier 2
CH4 emissions due to manure management	IPCC guidelines Tier 2	IPCC guidelines minimum Tier 2
Direct and Indirect N2O emissions from livestock manure	IPCC guidelines Tier 2	IPCC guidelines minimum Tier 1
NH3 emissions from livestock manure	IPCC guidelines Tier 2	EMEP/EEA guidelines minimum Tier 2
NO emissions from livestock manure	-	EMEP/EEA guidelines minimum Tier 2
NMVOC emissions from livestock manure	-	EMEP/EEA guidelines minimum Tier 2
Particulate matter emissions from livestock manure	EMEP/EEA guidelines minimum Tier 3	EMEP/EEA guidelines minimum Tier 2
Soil C stocks in grassland	Based on FAO statistics and IPCC calculation rules, following the PAS 2050-1 methodology	Not taken into account unless land use change happened less than 20 years before assessment year.

Table 0-1: Main differences between Agri-footprint approach and CMWG baseline approach (CMWG = Cattle model working group, CH4 = Methane, EMEP/EEA = European Monitoring and Evaluation Programme / European EnvironmentAgency , FAO = Food and Agriculture Organisation of the United Nations, IDF = International Dairy Federation, IPCC = Intergovernmental Panel on Climate Change, N2O = Nitrous Oxide, NH3= Ammonia, NMVOC = Non-methane volatile organic compounds)

2.2. Systems to be compared

Currently, two bovine farming systems are included in Agri-footprint: a Dutch dairy system (producing raw milk, calves and cows for slaughter), and an Irish suckler-beef system (which only produces beef for slaughter). Also the associated slaughterhouse processes are included in Agri-footprint. Of these two bovine systems, two variants are modelled; the 'default' Agri-footprint inventories and modified 'PEF-compliant' inventories that comply to the rules of the CMWG document. To assess the effect of the CMWG allocation approach and emissions modelling, the 'PEF-compliant' Irish beef and Dutch dairy models are compared to the 'default' Agri-footprint inventories. A description of the underlying data and sources can be found in the methololodgy and data reports [2][3] accessible through www.agri-footprint.com. The unit of analysis was "1 kg of beef meat, fresh at slaughterhouse". The Irish beef LCI was based on a study by Casey and Holden [4], whereas the Dutch dairy system was based on previous work by Blonk Consultants [5].

3. Results

Figure 1 presents the characterized results for Irish beef while *Figure 2* presents the results for meat from Dutch dairy. As can be seen in

Figure 1, the PEF compliant model is similar to the default Economic allocation approach of Agri-footprint. This makes sense as the CMWG recommends economic allocation at the slaughterhouse (and no allocation takes place on the farm). The only differences can be explained by different modelling approaches for calculating emissions from enteric fermentation and manure management.

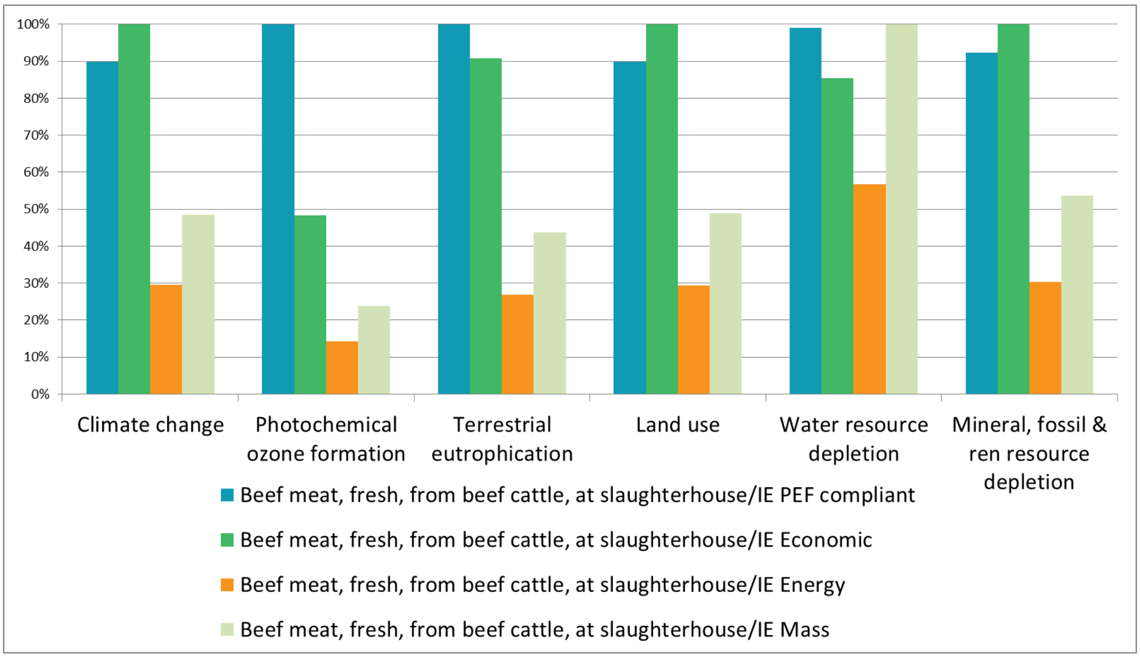

Figure 1: Impacts from beef meat, fresh, at slaughterhouse from Irish beef cattle. Results for the allocation as agreed in CMWG, and the three default Agri-footprint allocation options respectively.

However the results for beef meat from Dutch dairy cows, shown in *Figure 2* are substantially higher than the default Agri-footprint model. This is mainly explained by a shift in allocation on the dairy farm. Whereas Agri-footprint uses economic, mass or energy allocation, the PEF compliant model applies IDF allocation. In the PEF compliant study 12.35% of farm impacts are allocated to the cows for slaughter, whereas in the default Agri-footprint model (with economic allocation) 5.2% is attributed to the cows (and even lower in the other two allocations). This explains the big discrepancy between the results.

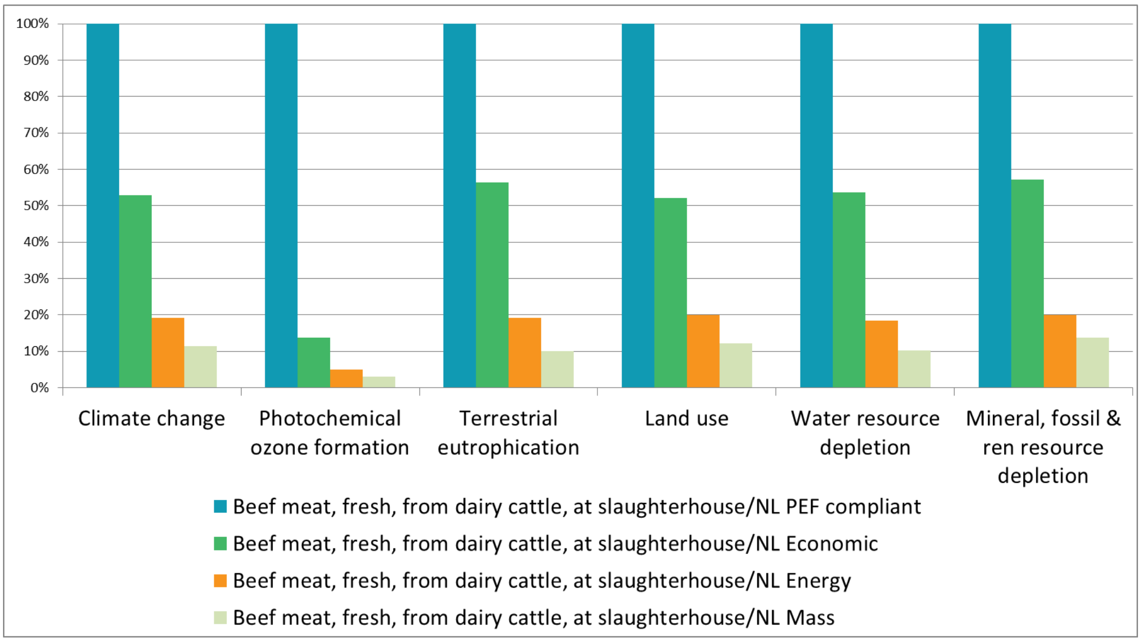

Figure 2: Impacts from dairy cow meat, fresh, at slaughterhouse from Dutch dairy cattle. Results for the allocation as agreed in CMWG, and the three default Agri-footprint allocation options (Economic/Energy/Mass), respectively.

4. Conclusion

For Irish beef, the PEF compliant model provides similar results as the default Economic allocation approach of Agri-footprint. The only differences can be explained by different modelling approaches for calculating emissions from enteric fermentation and manure management. However the results for beef meat from Dutch dairy cows, are substantially higher than the default Agri-footprint model, which can be explained by the differences in allocation.

Whereas the more detailed emissions modelling calculations proposed by the CMWG can be seen as a refinement of the method, the decision to use IDF allocation on the dairy farm level has a major influence on the outcomes of future PEF studies of meat from dairy systems. This emphasizes that in order to make a fair (environmental footprint) comparison between products, clear calculation guidelines for cross-cutting issues between the PEF pilots need to be established, which should also be reflected in any secondary databases that are used.

5. References

[1] JRC, "Baseline Approaches for the Cross-Cutting Issues of the Cattle Related Product Environmental Footprint Pilots in the Context of the Pilot Phase," 2015.

[2] Blonk Agri-footprint BV, "Agri-footprint 2.0 - Part 1 - Methodology and basic principles," Gouda, the Netherlands, 2015.

[3] Blonk Agri-footprint BV, "Agri-footprint 2.0 - Part 2 - Description of data," Gouda, the Netherlands, 2015.

[4] J. W. Casey and N. M. Holden, "Quantification of GHG emissions from sucker-beef production in Ireland," Agric. Syst., vol. 90, no. 1–3, pp. 79–98, Oct. 2006.

[5] R. Broekema and G. Kramer, "LCA of Dutch semi-skimmed milk and semi-mature cheese," 2014.