Analysis of inconsistencies between Product Category Rules in the same supply chain – a case study of food PCRs

Kristian Jelse[1,*], Filippo Sessa[2], Massimo Marino[2], Joakim Thornéus[1], Rita Schenck[3]

[1] IVL Swedish Environmental Research Institute Ltd.
[2] Life Cycle Engineering Srl.
[3] Institute for Environmental Research and Education
[*] Corresponding author. E-mail: *kristian@environdec.com*

ABSTRACT

According to ISO 14025, Product Category Rules (PCRs) are developed as the basis for environmental declarations. The PCRs define the requirements for the underlying life cycle assessment and the format for reporting in an Environmental Product Declaration (EPD) for a given product category. Because PCRs are developed separately by the interested stakeholders, one risk of this approach is that similar methodological aspects could be treated differently in different but related PCRs. The International EPD System has developed a network approach for food PCRs to avoid inconsistencies by 1) creating one document identifying issues common to all food PCRs; and 2) simplifying the development of new PCRs by permitting inclusion by reference of aspects treated in other PCRs. It may be appropriate to extend this network methodology also to other product groups and sectors, and to extend the co-ordination across program operators.

Keywords: Product Category Rules, Food, Environmental Product Declaration, PCRs management, ISO 14025

1. Introduction

Product Category Rules (PCR) define the requirements for the underlying life cycle assessment and the format for reporting in an environmental declaration type III for a given product category. PCR documents are developed within a program for environmental declarations type III according to ISO 14025 (ISO, 2006).

Although the details regarding the process might differ somewhat between programs, PCRs in the same program are normally drafted by the stakeholders interested in the product group. Because PCRs may have scopes covering intermediate or final products, different PCRs may include the same life cycle stages and associated methodological guidance. There is thus a risk that similar methodological aspects are treated in different ways in related PCRs. An example could be wheat that is used an ingredient for many food products such as pasta and bakery products. If the calculation rules for the wheat cultivation process are described separately in the PCR for pasta and the PCR for bakery products, some key methodological aspects shared by the two product systems may be managed in different ways.

The International EPD System is a program for type III environmental declarations with a broad scope in terms of product categories and geographical area covered. As of April 2014, there are 108 PCRs registered within the program, whereof 27 belong to the category "Food and agricultural products" (International EPD System, 2014). The PCRs within this category have been developed in a time period of several years and by different stakeholders. All PCRs fulfill the program instructions of the International EPD System but within the PCRs, in some cases, different approaches have been taken, leading up to inconsistencies. To avoid anticipated inconsistencies between related PCRs, a pilot project called the "Network of PCRs for Food" was initiated in 2013 with the scope of agricultural and food products (International EPD System, 2013b).

2. Methods

This paper identifies and analyses the methodological inconsistencies between PCRs within the International EPD System and how they have been treated in the first year of the network of PCRs for food pilot project. The method chosen is a qualitative identification of the key methodological questions and a comparison of the different guidance given in the PCRs before and after the alignment. The main LCA methodological aspects that are normally covered by PCRs include (International EPD System, 2013):

- Functional unit
- System boundary
- Allocation procedure
- Data quality requirements

- Cut-off rules
- Data collection and calculation procedures
- Impact assessment categories
- Scenario assumptions

The analysis focuses on these methodological aspects and on seven linked PCRs available within the food and agricultural products category of the International EPD System; see Table 1. PCRs and related guidance documents from other programs and initiatives were not included in the scope of the analysis.

Table 1. Food and agricultural PCRs in the International EPD System included in the analysis.

Name [a]	PCR registration number	Version
Arable crops	2013:05	1.01
Raw milk	2013:16	1.01
Processed liquid milk and cream	2013:17	1.01
Yoghurt, butter and cheese	2013:18	1.01
Meat of mammals	2012:11	2.0
Grain mill products	2013:04	1.02
Uncooked pasta	2010:01	2.0

The identified connections between the different PCRs are illustrated in Figure 1. There are three levels of the PCRs, with the ones earlier in the supply chain function as the upstream system for the following two levels. The PCR for arable crops (including wheat) is part of the shared upstream supply chain for all the other analyzed PCRs, including milk, meat and grain mill products. The PCR for raw milk relates to the animal husbandry, which is the same technical system as is described in the PCR meat of mammals. From an LCA perspective, beef and raw milk are two co-products from the same process, which results in an allocation problem to be handled in the PCR. The different dairy products are covered by two different PCRs, which share a similar allocation problem between different co-products from the dairy plant.

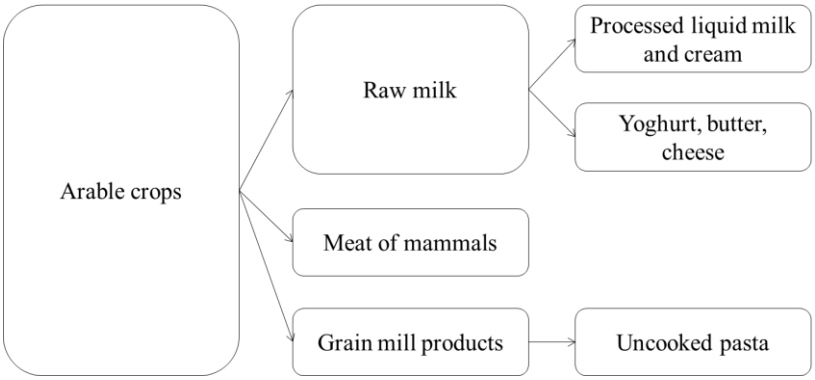

Figure 1. Identified supply-chain connections between the analyzed PCRs.

3. Results

3.1. Identified inconsistencies

The qualitative assessment identified that potential methodological aspects were those normally specified in a PCR: system boundaries, data quality requirements, allocation procedures and allocation factors. Aspects such as the choice of systems approach (e.g. attributional or consequential LCA) and environmental impact categories were less relevant in the analyzed PCRs because the basic requirements for these aspects are set up in the General Program Instructions and thus shared between all PCRs (International EPD System, 2013a). The main methodological aspects with potential inconsistencies that could alter the results among the analyzed PCRs were identified as:

- factors used for the estimation of emissions from fertilizer use (EF),
- allocation between agricultural co-products (AG),
- allocation between milk and meat (MM),

– allocation among co-products at the mill (MI),
– allocation among co-products at dairy plant (DP).

Table 2 lists all the PCRs in which the analyzed factors were treated. Some of the aspects (EF and AG), were treated in all the analyzed PCRs, while other were only treated in some of the analyzed PCRs.

Table 2. Main methodological aspects and PCRs where they were treated – before the network of PCRs.

	Arable crops	Raw milk	Processed liquid milk and cream	Yoghurt, butter, cheese	Meat of mammals	Grain mill products	Uncooked pasta
EF	X	X	X	X	X	X	X
AG	X	X	X	X	X	X	X
MM	-	X	X	X	X	-	-
MI	-	-	-	-	-	X	X
DP	-	-	X	X	-	-	-

These methodological aspects may greatly affect the environmental impact of a product. As an example the results for climate change (calculated with Global Warming Potential, 100 years) of wheat grain and straw as a function of different methods of allocation was calculated (Figure 2). While the results may vary greatly between different cases and methodological aspects, the example shows that the results have the potential to vary significantly (here: -45% for mass allocation compared to the case where straw is considered as waste).

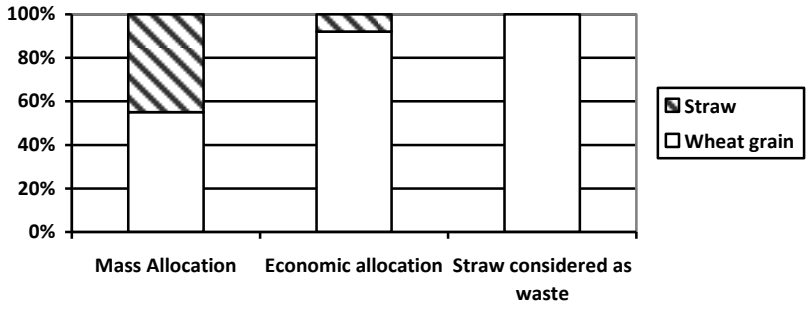

Figure 2. Normalized example results for the climate change indicator results (calculated with GWP, 100 years) of wheat grain and straw as a function of different methods of allocation. The result of straw considered as waste has been set to 100%.

An EPD in the International EPD System uses as a default life cycle inventory (LCI) indicators for resources use and four environmental impact categories (International EPD System, 2013a). Table 3 shows which methodological aspects affect which indicator results and environmental impact categories.

Table 3. Main methodological aspects and potentially affected indicator results and environmental impact categories.

Factor	Resource use (LCI)	Climate change	Acidification	Eutrophication	Photochemical oxidant formation
EF	-	X	X	X	-
AG	X	X	X	X	X
MM	X	X	X	X	X
MI	X	X	X	X	X
DP	X	X	X	X	X

Four of the five analyzed factors (AG, MM, MI and DP) have an influence of all the indicator results declared in an EPD, since different methods of allocation lead to different life cycle inventories and resulting environmental burdens attributed to the product object of the EPD. The other factor, EF, influences mainly the impact categories Climate change, Eutrophication and Acidification.

To avoid inconsistencies within the network it was decided to treat each of the methodological aspects in a single PCR and make reference to that in the other PCR documents (see Table 4). An example of this approach

is that in the PCRs for arable crops rules for EF and AG are given. In the other PCRs in the upstream phase, the guidance on these methodological aspects is replaced by references to the PCR for arable crops.

Table 4. Main methodological aspects and in which PCRs they were treated – after the network of PCRs.

Factor	Arable crops	Raw milk	Processed liquid milk and cream	Yoghurt, butter, cheese	Meat of mammals	Grain mill products	Uncooked pasta
EF	X	-	-	-	-	-	-
AG	X	-	-	-	-	-	-
MM	-	X	-	-	X	-	-
MI	-	-	-	-	-	X	-
DP	-	-	X	X	-	-	-

In some cases, such as those of MM and DP, it was not possible to treat an aspect in only one PCR document, because some the PCRs involved (in this case Processed liquid milk and cream and Yoghurt, butter and cheese) are "parallel", that means that they are at the same level of the supply chain and describe two different co-products from the same process. In such cases the coordination of the network ensured that these aspects are treated in the same way in both PCRs. The motivation to keep two different PCRs is that there is still a need for separate guidance for aspects such as the functional unit of the two different products.

3.2. Alignment of inconsistencies

Another issue was how to treat the aspects, since different approaches were possible and were already used in some PCRs. In Table 5 the analyzed and the chosen approaches are reported.

Table 5. Approaches used in the PCRs before the network, and the chosen approaches after the implementation of the network.

Factor	Approaches used before the network of PCRs	Chosen approach
EF	1. Data from literature (global) 2. Data from literature (regional) 3. Primary data	Data from literature (global) in absence of primary data.
AG	1. Economic allocation 2. Physical allocation (mass) 3. By-products considered as waste	Economic allocation
MM	1. Economic allocation, 2. Physical allocation (mass)	Economic allocation
MI	1. Economic allocation, 2. Physical allocation (mass) 3. By-products considered as waste	By-products considered as waste
DP	1. Economic allocation 2. Physical allocation (wet mass, dry mass, mass of protein and fat) 3. By-products considered as waste	Physical allocation (mass of protein and fat)

The approaches to be used were chosen after an open consultation with the interested stakeholders when each PCR was updated. The choice of the approaches was made according to the main literature and to the experience of the involved experts.

4. Discussion

The International EPD System's food PCRs network is the first known example of increased coordination of PCRs in an ISO 14025 program. The results of the present study demonstrate that without coordination there would be many inconsistencies, which would make an objective evaluation of different products environmental performances impossible.

The problem of LCI modelling inconsistencies is not only relevant within the same program. Different ISO 14025 programs have chosen different methodological bases and product group classification systems that may or may not be compatible. There are also many initiatives to develop PCRs in programs similar to, but not based on, ISO 14025, such as the European Commission Product Environmental Footprint.

To put a similar coordination in place among different ISO 14025 programs is a big challenge but it certainly should be a target for which to aim.

5. Conclusion

The International EPD System's Network of PCRs has two main positive effects: avoiding methodological inconsistencies between PCR documents (by treating issues common to different PCRs in only one PCR document) and simplifying the development of new PCRs (by allowing incorporation by reference to the relevant PCR document). These benefits also translate to positive effects in the development of environmental declarations: the comparability is strengthened and the time needed to develop the first declaration in a product category is reduced.

For these reasons it may be appropriate to extend the methodology of the network to other product groups and sectors, for example construction products, wood and paper products or textile products, and to extend the co-ordination across ISO 14025 program operators and incorporated into initiatives independent from ISO 14025 such as the European Commission Product Environmental Footprint (EC, 2013). The insights gained on the need for alignment of PCRs in the same supply chain could also be relevant for guidance documents and international standards related to PCRs, such as the Guidance for Product Category Rule Development (Ingwersen and Subramanian, 2013).

6. References

EC (2013) Commission recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations. Official Journal of the European Union, 2013/179/EU.

International EPD System (2013a) General programme instructions for the International EPD system. Version 2.01, dated 2013-09-18.

International EPD System (2013b) Introducing the network of PCRs for food products.

International EPD System (2014) Website of the International EPD System. Last accessed: April 30th, 2014.

ISO (2006) Environmental labels and declarations - Type III environmental declarations - Principles and procedures, ISO 14025:2006.

Ingwersen, W., Subramanian, V., editors. (2013) Guidance for Product Category Rule Development. The Product Category Rule Guidance Development Initiative. Version 1.0. http://www.pcrguidance.org

This paper is from:

Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector

8-10 October 2014 - San Francisco

Rita Schenck and Douglas Huizenga, Editors
American Center for Life Cycle Assessment

The full proceedings document can be found here:
http://lcacenter.org/lcafood2014/proceedings/LCA_Food_2014_Proceedings.pdf

It should be cited as:

Schenck, R., Huizenga, D. (Eds.), 2014. Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector (LCA Food 2014), 8-10 October 2014, San Francisco, USA. ACLCA, Vashon, WA, USA.

Questions and comments can be addressed to: staff@lcacenter.org

ISBN: 978-0-9882145-7-6