Barilla EPD Process System to increase reliability, comparability and communicability of LCA studies

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ABSTRACT

The aim of this work is to show how a large company integrates the life cycle approach into its policies and views to reduce the footprint using reliable data suitable also for communication purposes.
During 2010 an internal LCA process was implemented and in February 2011 certified, being the first private company, in compliance with the Process Certification Clarifications guidelines for International EPD® System to perform environmental impact calculation in an easy, quick and reliable way and to provide certified and published results.
Barilla's EPD internal process is based on three main elements: the LCA database, the Product System and the Product Specific data. They are used together as a funnel process: data from the database and from product specific information are processes by the product system tool to have the specific LCA data sheet results, used for a type III label (EPD – Environmental Product Declaration) preparation.
The reliability of the system is guaranteed by both internal and external verification.

Keywords: PCR (Product Category Rules), EPD (Environmental Product Declaration), EPD Process System, LCA for food, verified database

1. Introduction

Barilla, one of the top Italian food groups, produces more than 100 products in about 50 plants around the world. The company has been using the LCA for more than a decade. Since 2008, life cycle thinking made its way into company strategy, as an instrument to thoroughly study the production chain and localise the most substantial environmental impacts.

Barilla decides to join the International EPD System for several reasons: the System acts following the International Standards (ISO 14025); the reliability of the LCA is assured by the Product Category Rules (PCR); the System allows the comparability among the same product group, each document with a public interest (such as Product Category Rules (PCR) and General Program Instruction (GPI)) is published; public register on PCR and EPD is regularly updated; EPDs and LCAs must cover all the environmental issues not merely focusing on greenhouse gases emissions; the System gives the possibility to develop an EPD Process Certification.

Barilla's aim is to develop the EPDs for the major part of its product and the only way to make it in an easy, simple and reliable manner is to use an EPD Process System; for this reason, during 2010, it was developed and certified by Bureau Veritas in 2011.

The scope of the Process System is to prepare, verify and publish EPDs for Barilla's products related to the following Product Category Rules:

- Product Category Rules 2010:01 (CPC 2371): Uncooked pasta, not stuffed or otherwise prepared
- Product Category Rules 2012:06 (CPC 234): Bakery Products
- Product Category Rules 2010:09 (CPC 23995): sauces; mixed condiments; mustard flour and meal; prepared mustard

2. General Structure of the Barilla EPD Process

All EPDs coming from the Barilla's EPD Process System are based on the Life Cycle Assessment methodology; using the following three main elements:

1. The Product Specific data
2. The LCA dBase
3. The Product System

The system works like a "funnel process", as showed in figure 1: product specific information are collected and elaborated by the product system using the LCA dBase, then results are collected in a specific LCA data sheet, that is then used for the preparation of the EPD.

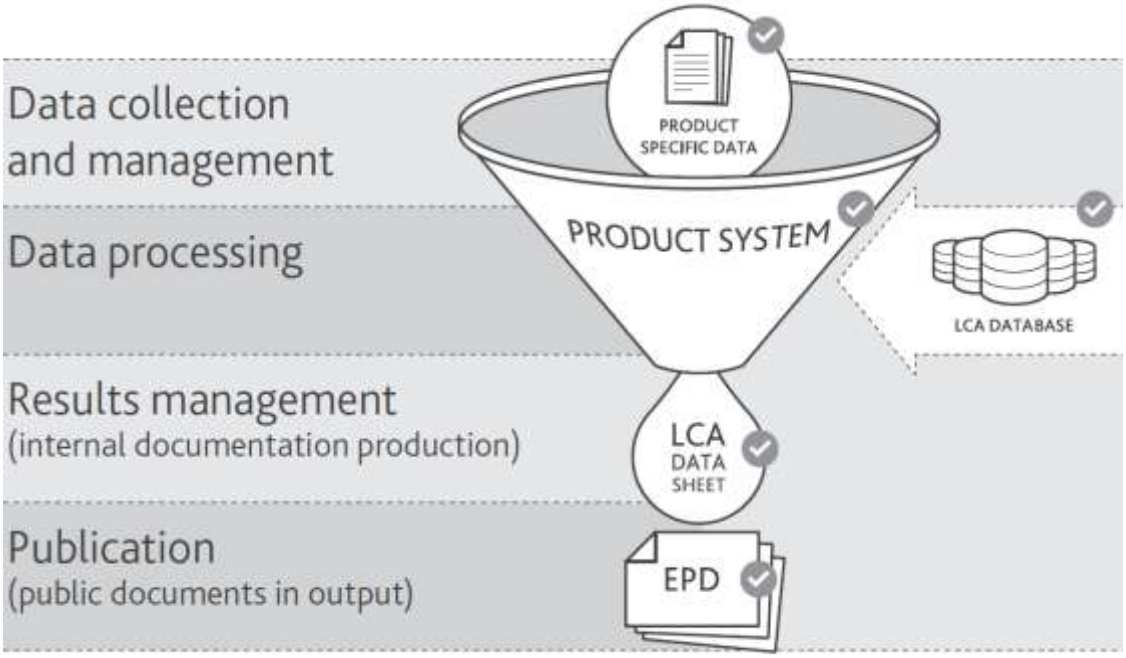

Figure 1. Scheme of the Barilla EPD Process System ("funnel process")

2.1. Product Specific Data

Product specific data represent all the specific information related to the product that has to be analysed, they have to be collected for each EPD and include the following specific information:

- Product recipe: includes the amount of food raw materials per unit of product (e.g. kg of sugar or vegetable oil or flour etc per kg of product)
- Bill of materials packaging list: that includes the amount of packaging materials used for product packaging
- Production plants where the product is manufacturing
- Production volume per each plant involved
- Finished product logistic distribution data (kilometers covered and transport means)
- Other relevant environmental aspects, such as liquid nitrogen and carbon dioxide consumption used for product cooling

Figure 2 provides an example of product system calculation with the relationship between product specific data and LCA dBase.

2.2. LCA dBase

The database is organized among different data modules groups:

- Raw materials: includes information about materials used for food product recipe (e.g. durum wheat cultivation for semolina production)
- Packaging raw materials (e.g. cardboard manufacturing for American box production);
- Energy: includes data about the energy mixes used in the countries in which the Barilla's plants are located. The database is updated every time new information is available;
- Plants: contains information about the processes that take place in the Barilla's plants. These data are based on the data collection and they are updated every year.
- Transports: data on the main means of transport used for the Barilla's purposes

Each data module contains all the environmental aspects related to material or process, main hypothesis applied, as requested by the ISO 14040 series (functional unit, system boundaries, data quality, data collection and treatment, allocation and cut-off rules).

All data modules are internally verified and are ready to be used for EPD purposes, they are inserted in software SimaPro®, that was selected as the modeling and calculation tool for the Barilla EPD system process.

2.3. The Product System

The Product System represents the product group model calculation tool. It is developed for each product group in a specific fashion following the Product Category Rule (PCR) and is internally vetted.

Barilla's EPD Process System includes Product Systems for pasta, bakery and sauces products. An example of product system for bakery product is reported in figure 2.

	Product specific data		LCA database		Total
Product Recipe	Grams of ingredients per kg of product	X	Impacts per kg of ingredients	=	Impacts per kg of products due to the ingredients
					+
Bill of materials packaging list	Grams of materials per kg of product	X	Impacts per kg of packaging materials	=	Impacts per kg of products due to the packaging
					+
Plants	Plants in which the product is made and quantities	X	Impacts per kg of products made by the specific plants	=	Impacts per kg of products due to the production
					+
Logistic distribution	Km covered by train, truck and ship	X	Impacts per km by train, truck and ship	=	Impacts per kg of products due to the transportation
					+
Other aspects	Natural gas for bakery	X	Impacts per Nm³ of burned NG	=	Impacts per kg of products due to the bakery
					=
			LCA Data sheet		Impacts per kg of product

Figure 2. Example of product system for bakery products

2.4. Verification levels

The reliability of the EPDs is ensured by several verification levels done by Data Assessor, Process Assessor and Verification Body:

1. Product System and LCA Database verification is performed by the Data Assessor;
2. Product specific data, LCA data sheet and EPD Document verification is performed by the Data Assessor per each EPD realized
3. EPD Process verification by means of:
    - internal audit, performed by the Process Assessor
    - external audit, performed by a Verification Body (accredited body certified for audit of management systems)

3. Process Operations

Barilla EPD Process System is organised in three main processes, under the control of the management activities: EPD project, database update and product system update.

The management activities take into consideration all the actions that are necessary for activities coordination and organization, such as EPDs planning, competences evaluations, process assessment planning, non conformity management and system documentation updating.

An overview of the processes is given in figure 3.

The first activity of the system is the EPD planning, it is performed each year to organize all the works related to the EPD Process System.

In order to do a reliable planning of the EPD projects, the collection of all the product recipe is necessary to identify raw material still not covered by an update data module.

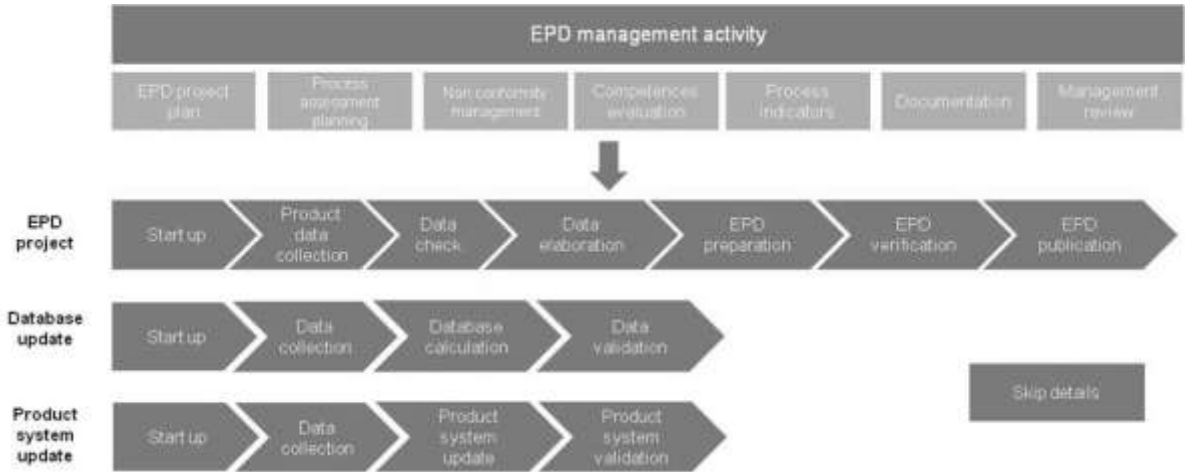

Figure 3. Overview of the process operations

The main process of the system is the EPD Project, which leads to the verification and publication of the EPD document, starting from the Product data collection and passing through data check and elaboration and EPD verification.

Database update is performed each time data must be updated (e.g. for energy mix) and at least once a year. In addition, data is updated during the data check of the EPD Project when data is unavailable for the model. This puts the EPD project process in standby and the database update process starts. The EPD Project process resumes only when all data necessary for the EPD preparation is available and validated.

The product system update process allows to update the product system model when there is a change to its product category rules and compiles a new product system when a new product must be analysed and inserted into the system.

4. Process Indicators

The Barilla EPD process performances are evaluated by mean of specific indicators, reported in table 1.

Table 1. Overview of the indicators used for measuring the EPD Process performances

Indicators	Unit	Description
Product volume covered by EPDs	%	Percentage of product volume covered by EPDs
Planned projects	n°	Number of the EPD projects planned each year (one EPD project may have one or more products)
Open Projects	n°	Number of the EPD projects that are still open in a specific moment
Frozen Projects	n°	Number of the EPD projects that are stopped because a database/data system update is running
Validated EPD	n°	Number of validated EPD (not all of them are published)
Published EPD	n°	Number of published EPDs available
Product System	n°	Number of product system available for all the Barilla products
Product System validated	%	Percentage of total product system validated and available for EPD realization
Product Volume covered by Product System	%	Percentage of product volume covered by Product System
Total module	n°	Total amount of the data modules that are needed for completing the EPD activities included in the running project.
Available data module	%	Percentage of the total data module available for EPD realization. It represents how much the data collection performance is completed.
Validated data module	%	Percentage of the total data module that are validated and ready for the EPD calculation. It represents the measure on how much the database is completed with validated information.

5. Actors and roles

EPD Process management is guaranteed by the mutual works of different actors: EPD process owner, LCA developer, data owners, data expert. All roles are described below:

- EPD Process owner: is the EPD system process responsible who has decision-making power and represents Top management for the EPD purposes; defines the policy and approves all documents and decisions related to EPD issues, avails himself of an EPD Process Manager;
- LCA developer: is supported by an LCA team, that manages all the activities necessary for the EPD document preparation, data modules and product system development and update;
- Data owners are in charge of providing data and information needed for LCA calculations. They usually have precise functions and are responsible for specific areas (e.g. packaging production, production process, product transport, etc). They are identified and involved in data collection according to the annual EPD work plan and they have to know the procedure for the data collection;
- Data expert represents personnel that could assist both specific data verification (peer review) during LCA calculation and EPD preparation. A data expert may be identified during the management review to support data collection and verification during LCA calculation. A data expert may be sought for strategic and relevant information such as wheat cultivation, palm oil production, etc. This figure can either be an internal or external resource;

The system reliability is guaranteed by several verifiers (data assessor, process assessor and verification body), their roles are described below:

- Data assessor: is personnel responsible for the verification of the LCA calculation and of the EPD document. The data assessor conducts internal assessments at planned intervals to determine the reliability, relevance and independence of the EPD;
- Process assessor: is an internal verifier that regularly assesses the conformity of the EPD process. The process assessor is the internal verifier that has the responsibility to perform periodic audits on system application;
- Verification Body: represents an accredited body certified for audit of management systems that verifies the entire EPD process system.

Each actor in the process has qualified and formalized competences.

6. Results and Conclusion

Barilla is the first private company that has developed an EPD Process System.

About the 46% of the products put on the market by Barilla during year 2011 are covered by an Environmental Product Declaration (EPD). At 30th April 2012, fifteen EPDs were published on the website[1] and about six hundreds data modules were realized; the available data modules are over the 90% and validated data modules among the available ones are over the 75%.

The use of the Barilla EPD Process System has shortened EPD publication timing, that now lasts about 6 - 10 weeks.

Table 2. Performance of the EPD Process System

Indicators	Unit	Data
Product volume covered by EPDs (year 2011)	%	46%
Planned projects (year 2012)	n°	39
Open Projects (point at 30/04/2012)	n°	13
Frozen Projects (point at 30/04/2012)	n°	0
Validated EPD (point at 30/04/2012)	n°	18
Published EPD (point at 30/04/2012)	n°	15
Product System (point at 30/04/2012)	n°	6
Product System validated (point at 30/04/2012)	%	67%

[1] http://www.environdec.com/en/EPD-Search/?query=barilla

Product Volume covered by Product System (year 2011)	%	99,7%
Total module (point at 30/04/2012)	n°	610
Available data module (point at 30/04/2012)	%	97
Validated data module (point at 30/04/2012)	%	79

Table 2 shows the Barilla EPD Process System performances through the system indicators, from 2010 to April 2012. Looking at the table, it's important to point out that:

- There are 39 EPD projects planned for 2012; 13 of these contain more than one product to be analysed because there are several recipe variants for some products;
- There are no frozen projects because there were no problems with data availability;
- There is a higher number of validated EPDs respect to published EPD because it was decided to not publish three of the validated EPDs;

From year 2010 to April 2012 forty verifications were performed: four external verifications made by Bureau Veritas, and the others made by data and process assessors for internal verifications.

7. References

ISO 14040 - Environmental management, Life cycle assessment, Principles and framework;

ISO 14044 - Environmental management, Life cycle assessment, Requirements and guidelines;

ISO 14025 - Environmental labels and declarations - Type III environmental declarations - Principles and procedures;

International EPD Cooperation; introduction, intended uses and key programme elements; version 1 of 29/02/2008

International EPD Cooperation; General Programme Instructions for Environmental Product Declaration; version 1 of 29/02/2008;

International EPD Cooperation; Supporting annexes for Environmental Product Declaration; version 1 of 29/02/2008;

International EPD Cooperation; Process Certification Clarification (PCC) for the International EPD System; Guidelines; ver. 1.0 of 23/04/2010;

International EPD Cooperation; Process certification clarification for the International EPD® system. Version 1.0 of 23/04/2010;

International EPD Cooperation ; PCR 2010:01; CPC 2371: Uncooked pasta, not stuffed or otherwise prepared; version 1.1 of 18/06/2010;

International EPD Cooperation; PCR 2012:06; CPC 234: Bakery Products; version 1.0 of 17/04/2012;

International EPD Cooperation ; PCR 2010:09; CPC 23995: Sauces; mixed condiments; mustard flour and meal; prepared mustard; version 1.1 of 9/11/2010;

www.environdec.com.