Earth sure Packaged Single Entrée-2009 Final Product Category Rule

10 April 2009

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Executive Summary

This document lays out the requirements for performing the analysis for an environmental product declaration on under the Earth sure Packaged Single Entrée Product Category. This product category rule covers the entire life cycle of the product from cradle to grave, except that the issues of human wastes are ignored.

The table below summarizes all the requirements for performing the analysis.

Figure 1 Summary PCR Requirements

Required Point for ISO 14040/44/25	Requirements	
The intended application 14040: 5.2.1.1; 14044:4.2.2	Type III Environmental Product Declarations	
The reasons for carrying out the study 14040:5.2.1.1; 14044:4.2.2	To support the EPD; to learn more about environmental impacts of the product; to improve environmental performance	
The intended audience, i.e. to whom the results of the study are intended to be communicated 14040: 5.2.1.1; 14044:4.2.2; 14025:9.1	Business customers; the general public	
Whether the results are intended to be used in comparative assertions intended to be disclosed to the public. 14040:1.2.1.1; 14044:4.2.2	No comparative assertions are intended	
Product system to be studied 14040:5.2.1.2; 14044:4.2.3.1; 14025:6.7.1	The packaging and contents of single serve packaged entrees	
Functions of the product system 14040: 5.2.1.2; 14044:4.2.3.1; 14025:6.7.1	Provide a single-serving entrée that is prepackaged and can be stored for at least 6 months.	
Functional unit 14040: 5.2.1.2; 14040:5.2.2; 14044:4.2.3.1; 14044:4.2.3.2; 14025:6.7.1	One serving, per the US Food and Drug Administration, where applicable.	
System boundary 14040: 5.2.1.2; 14040:5.2.3; 14044:4.2.3.1; 14044: 4.2.3.3.1; 14025:6.7.1	See attached flow chart	
Which life cycle stages are included	Cradle to grave (human waste not included)	
Unit Process Descriptions 14044: 4.2.3.3.2	Agrichemical production and use; cradle to gate plastic resin manufacture; cradle to gate cardboard and corrugated manufacture; print chemical production and use; glue production and use; on-farm production; transport; fossil energy production and use; electricity production, transport and distribution; package manufacture; food preparation and packaging; retail; cooking; packaging disposal and recycling.	
Allocation procedures 14040: 5.2.1.2; 14040:5.3.4; 14044:4.2.3.1; 14025:6.7.1	Allocation in-plant is by number of units. Other allocation based on mass.	
Impact categories selected and methodology of impact assessment, and subsequent interpretation to be used; 14040: 5.2.1.2; 14044:4.2.3.1; 14044:4.2.3.4; 14025:6.7.1	**Impact Category**	**Model**
	Climate Change	IPCC 2007- 100 year horizon
	Stratospheric Ozone Depletion	Montreal Protocol
	Acidification	TRACI
	Eutrophication	TRACI

Required Point for ISO 14040/44/25	Requirements	
	Photochemical smog	TRACI
	Ecotoxicity	USE-tox equivalent, using LCA-tox
	Water resource depletion	Net freshwater use
	Mineral resource depletion	Mineral use for reserves<200 years
	Fossil fuel depletion	Guinée et al.
	Land use/biodiversity	Area of land occupied
	Soil depletion.	Mass of soil lost from site, Universal Soil Loss Equation
Units: 14025:6.7.1	Standard International (metric) units per functional unit	
Interpretation 14040: 5.2.1.2; 14044:4.2.3.1	Contribution analysis included	
Types and sources of Data 14044:4.2.3.5	peer reviewed preferred; USDA Data; US LCI where possible; Ecoinvent where not	
data quality requirements 14040: 5.2.1.2**;** 14044:4.2.3.1; 14044: 4.2.3.6.2; 14025:6.7.1		
age	No data over five years old, unless it can be documented that the unit process has not changed.	
geography	USA and Canada for final production	
cutoff values	95% of mass & energy; all known toxicity issues	
technology coverage	Each EPD covers less than 1% of the US packaged entrée market	
precision:	Addressed statistically	
industry coverage	Each EPD covers less than 1% of the US packaged entrée market	
representativeness	one year's production (year disclosed)	
uncertainty of the information	Ranges estimated by primary data source	
Additional Environmental Information 14025:6.7.1	None Provided	
Materials and Substances to be declared 14025:6.7.1	Statement that there are no such substances to the best of our knowledge. Foods follow FDA rules.	
Content and format of the label 14025:6.7.1	See below	
Assumption: 14040: 5.2.1.2; 14044:4.2.3.1	1) Consumption of food and the subsequent elimination and treatment are not affected by the environmental impact of the food production; 2) The production and disposal of infrastructure such as buildings, roads and equipment is small and can be ignored 3) Ecotoxicity measure provides adequate overall toxicity estimate	
Value Choices: 14044:4.2.3.1	End-point indicators are to be avoided where possible.	
Limitations 14040: 5.2.1.2; 14044:4.2.3.1; 14044:4.2.3.1	EPDs are applicable only to particular product for time of validity	
Period of validity of the label 14025:6.7.1	Three years	
Initial data quality requirements 14040:5.2.1.2; 14044:4.2.3.1	See above	
Type of critical review, if any 14040:5.2.1.2; 14044:4.2.3.1; 14044: 4.2.3.8; 14025:5.7	At least three member review for PCR; led by LCACP or equivalent, including at least one industry expert; ongoing internal independent review	
Type and format of the report required for the study 14040:5.2.1.2; 14044:4.2.3.1; 14025:6.7.1	Must conform to PCR Instructions	

Introduction

This document is the Product Category Rule for Packaged Single Entrees 2009 as part of the Earth sure program of the Institute for Environmental Research and Education. It was commissioned by Truitt Brothers, a processed food manufacturer, and the company whose product is the subject of the first EPD. The study was performed in conformance with ISO 14040, 14044 and 14025.

Goal

This document was prepared to initiate the Packaged Single Entrée product category. As part of the Earth sure program, its goal is to provide comprehensive environmental data to purchasers (business and individuals) so that the power of the market can move the economy towards overall environmental improvement. The primary audience is retailers purchasing the product and secondary audiences are manufacturers of food packaging and consumers.

This PCR does not intend to support a comparative assertion of overall environmental superiority of any given product. It merely discloses the environmental performance of that product.

EPD Report Contents

Any LCA study performed under this PCR must be based on the requirements of ISO 14040 and ISO 14044 and the report must include these components:

- Introduction: describing the product to be disclosed and the PCR and international standards under which the study was performed;
- Goal: the purpose of the study and its audience;
- Scope: per ISO 14040, must include a flow chart identifying foreground and background unit processes, as well as narrative on physical boundaries & excluded processes; system function & functional unit; data quality requirements;
- Inventory analysis, including data collection methods and a description of the unit processes, data sources, data quality assessment, allocation and missing data;
- Impact Assessment, including models and LCIA results;
- Interpretation, including a contribution analysis and data quality assessment;
- The EPD itself.

Scope

Physical Boundaries: omitted unit processes

The scope of PCR is the life cycle of a packaged single-serving entrée, from cradle to grave. The issues of human waste are omitted because good predictive models are not currently available, although this is

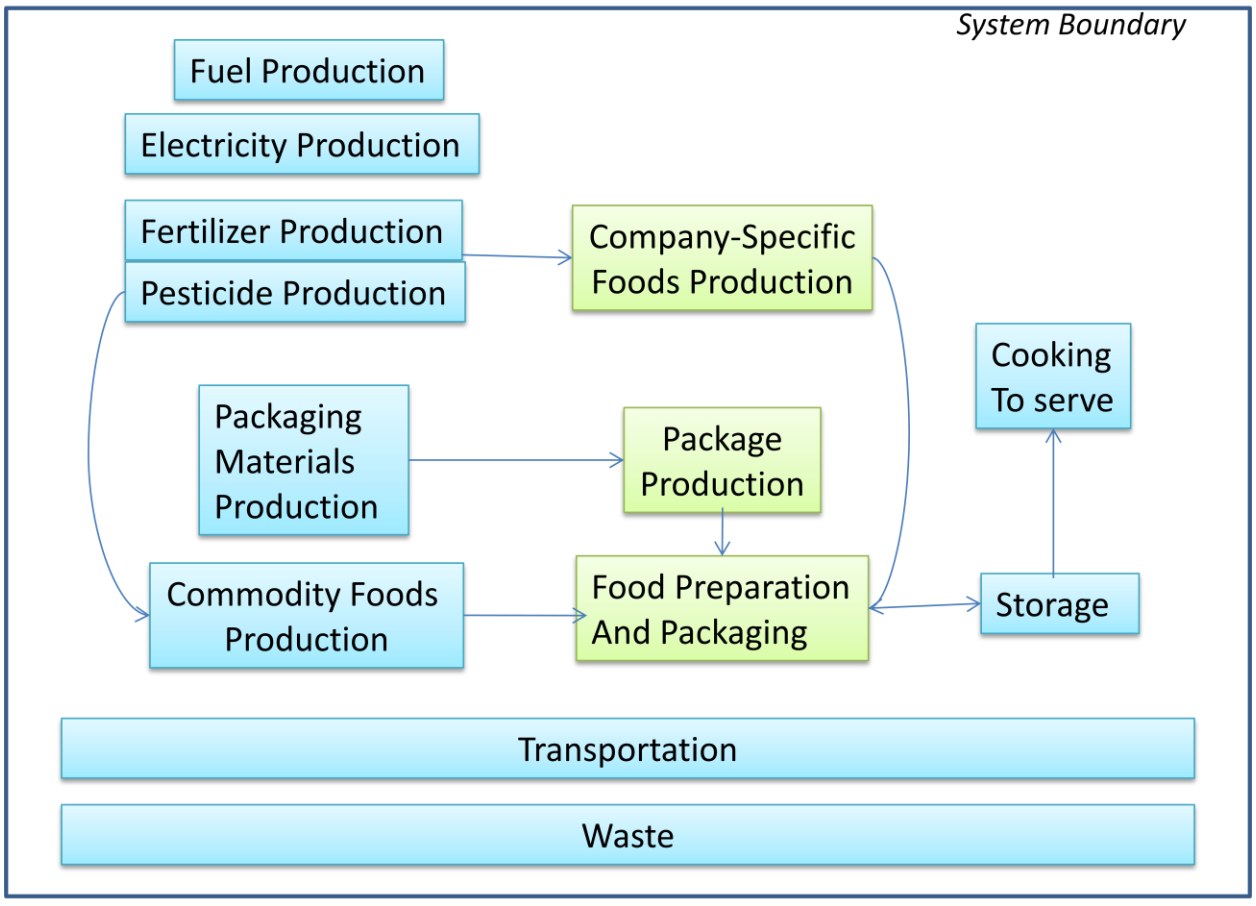
an active area of research. Also excluded are impacts of buildings, transportation systems and equipment production and demolition, which are assumed to be small compared to their operational environmental effects.

System Function & Functional Unit

The system function is to preserve and provide a meal entrée. It does not include multiple servings of a given entrée or multi-dish prepared meals such as a frozen dinner. It is recognized that a full meal may include other components, such as drinks, desserts or side dishes. There is no adjustment for nutritional value of the entrée, but this is disclosed in the product nutrition label. The functional unit is a single serving entrée preserved for six months.

The Figure below shows the system boundary of the study system. Blue unit processes are derived from secondary or tertiary sources (although primary data is acceptable if available), while the green unit processes must be derived from primary data.

Figure 2 System for the Packaged Single Entree



Note: Connections to energy, transportation & waste not shown

Data Quality requirements

Data and unit process general decisions are based on Schenck et al. (2008), modified for this product category rule. The specifics are noted here.

- Data sources (in order of preference): primary data; published peer reviewed data; USDA survey data; US LCI Inventory; Ecoinvent database.
- Age: not more than five years old, unless it can be shown that the process has not changed or no new data are available (noted in study)
- Cutoff rules: 95% of mass & energy; all known toxicity issues. Initial inclusion of any material or energy representing at least 1% of the system on a mass or energy basis.

Inventory Analysis

Data Collection Procedures

Primary data is collected using a questionnaires/spreadsheets provided to the manufacturer and their suppliers. They may be tailored for the particular application, but data collected must include

- Name of the organization and contact information;
- Dates over which data was collected;
- Unit Process Descriptions;
- Allocation type (if any);
- Amount of each ingredient or component, its source and transportation type;
- Composition of purchased materials (e.g. through MSDS and specification sheet);
- Packaging type and amount for ingredients or components;
- Sourcing location for packaging and transport type;
- Energy, water and chemical use;
- Emissions to air and water;
- Site-specific electric grid;
- Waste management amount, type, and location;
- Estimates of the quality of the data.

Fuel Production includes all fuel extraction, beneficiation, refinery, and transportation to the point of use. Infrastructure is specifically excluded. Data is obtained from the US Life Cycle Inventory Database. The emissions data is reported with the unit processes it supports.

Electricity Production includes all upstream impacts including fuel production, power generation, transmission and distribution to the point of use. Where the location of the use is known, local data on

the grid is used. Where only regional information is known, data from the regional grid is used. Where the electricity source is unknown the most recent US annual average grid data is used, per the US Energy Information Agency. The emissions data is reported with the unit processes where the electricity is used.

Fertilizer Production includes all extraction and processing of minerals to the facility gate. Data represent 30 to 60 percent of the fertilizer use in the USA in 2007 or more recent years as available, and are derived from primary data (available from IERE on request).

Pesticide Production includes all gate to gate resource use and emissions for production of pesticides. Where a specific pesticide is not known, a mass average of the pesticide production inventory is used, based on a mass equivalence. Analysis based on US production as found in the Ecoinvent database.

Packaging materials is a cradle-to-gate raw materials production, including extraction, refining or beneficiation, processing and packaging for shipping. This unit process includes production of inks and glues. Data are derived from either the US LCI database (where available) or the Ecoinvent database. Packaging for food transport from field to processing plant (e.g. totes) is also included. Packaging materials inventory is derived from either the US LCI database or the Ecoinvent database.

Package Production includes all activities between the creation of packaging materials and the point where a package is ready to fill. This includes processes such as extrusion, printing, box-making and the packaging of the package material. The resource use and emissions are calculated from primary data. Ancillary packaging (packaging for the packaging) is included in the calculations. Packaging materials and package production are reported together, but they differ in that the package production information is derived from primary data.

Commodity Foods Production includes all the activities on-farm, including tillage, irrigation, fertilizing, pest management, irrigation, heating, operation of machinery, use of veterinary chemicals, harvesting, waste management, primary processing and storage. Data represents the most recent USDA information from surveys performed by the National Agricultural Statistics Service. Where a particular crop data is not available, a similar crop may be substituted (e.g. bell pepper data in lieu of jalapeño pepper). Substitutions should be made with similar crops, e,g, legumes for legumes, grains for grains, meat from ruminants for meat from other ruminants.

Emissions of greenhouse gases from agricultural practices are estimated using the methods of the Intergovernmental Panel on Climate change. Animal products are modeled assuming that animals are grown in confinement. Where they represent a minor component of the entrée, they may be modeled as marginal production (i.e. as the production of one additional kg of meat or milk, rather than as a full life cycle). The USDA datasets represent a stratified random sampling of 80 to 100% of a given crop. Where data from the USDA is not available, data from the Ecoinvent database may be used.

Company Specific Foods Production covers all activities in commodity foods production except that the farms are known and the particular farm activities are modeled using primary data. Field specific data is gathered using questionnaires/spreadsheets. If the company is using non-commodity crops such as organic or free-range, it must work with its supplier to get specific data on the food it buys.

Food Preparation and Packaging includes commodity ingredient receipt, processing, and packaging. The resource use and emissions are calculated from primary data.

Storage and retail is receipt of and storage of completed product between the time that it is initially packaged and the time that it is cooked to serve. Storage may be in warehouses, at retail locations or in the consumer home. Storage inventory includes fuel consumption, power use for lighting and refrigeration, and use of refrigerants. Waste produced at retail is included in this unit process.

Cooking to Serve is the activities needed to prepare the food to eat. Most often this is microwaving, but entrees may also be heated by boiling or baking. These activities are estimated using published data for the different cooking techniques in the USA.

A review of data on the energy consumption of microwave ovens provides a range of power capacities, ranging from 750 to 1500 watts, with 1100 watts the most cited. Regardless of the power rating of a microwave oven, the amount of energy used to heat an entrée will be the same: heating time is adjusted to accommodate difference

About half of stoves and ovens in the USA are electric, with the remainder gas, and it requires about three times as much energy to cook an item using a conventional stove as it does a microwave oven.

Where an entrée may be cooked in a stove or oven, a scenario using alternative cooking methods must be analyzed and its impact on the indicators reported.

Waste includes all the waste produced at each of the unit processes, except that human waste is excluded. Where data on waste production and treatment is known (foreground data) the actual treatment scenario is used. Where background data is used, it is assumed that waste is 80% landfilled and 20% incinerated (the typical waste disposal for the US).

When materials are recycled, they are modeled with a system boundary expansion as displacing a virgin material, i.e. the inventory is modeled as the inventory of the recycling process – the inventory of the virgin materials they are displacing. The virgin materials may or may not be the same as the material recycled (i.e. either open or closed loop recycling).

When waste is managed in a waste-to-energy plant, the energy produced is modeled as displacing natural gas in a thermal system.

Transportation includes transport between unit processes (except where note above). It is separately modeled for each type of transport based on information from the Ecoinvent database. Absent specific information to the contrary, the following assumptions are made:

1. All rail is one-way
2. All trucks are 18-wheeler trucks carrying 20 short tons (18 metric tons) and having a haul-back 50% of the time (mileage = 1.5 times distance)
3. All waste management trucks are 10-ton trucks and return empty (mileage = 2x distance)
4. Ocean transport is via container ship, and no haul-back is considered.

5. Consumer transportation is modeled using information from the GREET model, and assuming that the trip to the grocery store is a 10-mile (16 km) round-trip, and that the total purchases on the trip is 22 pounds (10 kg).

Data Quality Assessment

Sensitivity Analysis of the System Boundary

Sensitivity Analysis was performed on the following scenarios

1) Exclusion of the human wastes. To a first-order estimate, all food consumed eventually is mineralized in the biogeochemical cycle. Of interest are issues of greenhouse gas emissions and phosphate and fixed nitrogen emissions from enteric and waste management systems. These emissions may affect the results of the climate change and the eutrophication impact categories.

   We have calculated the eutrophication potential due to the protein content of a typical 300-gram entrée. This results in about 3.5 grams of nitrogen equivalents per entrée. This is a surprisingly high result. It is possible that in the normal course of events much of the fixed nitrogen is denitrified to N_2.

   The greenhouse gas emissions by modeling the emission as:

   Respiration emissions $_{entree}$ = total annual CO_2 emissions $_{150\ lb\ person}$ x calories $_{entree}$/ calories $_{annual\ consumption}$

   and

   Enteric emissions $_{entrée}$ = US annual wastewater CH_4 emissions x calories $_{entree}$/ calories $_{annual\ consumption}$

   This results in approximately 100 grams of CO_2 equivalents per entrée, about half in respiratory emissions and half in enteric emissions. It is common practice to assume that emissions of biogenic CO_2 are carbon neutral, but that methane emissions are not.

One might question whether these are the appropriate sources of emissions factors. Not all human waste passes through wastewater treatment plants in the USA. On the other hand, a great deal of non-human, e.g. industrial wastes, pass through this system. We were not able to find estimates of direct human methane production, but found comments that they were very variable based on the food consumed and on the individual. These points underscore why we chose not to include human wastes in the original scoping of the EPD.

Allocation Procedures

Where possible, allocation must be avoided via system boundary expansion. However, this is not possible in the case where alternative uses do not exist for the products in question. In that case, allocation procedures must be based on mass.

An important exception to this rule is the allocation by number of units in the foreground data collection. This allocation is employed because the companies in this field typically do not track production by the total weight of their products, but they do track the number of units produced. Any given product is only a small fraction of the total production of the course of a year. Based on the range of weights of items produced, a sensitivity analysis must be performed to estimate the amount of error this might incur.

Missing data

Where data for a particular component is not available, a comparable component is used to substitute for it. In this case, a sensitivity analysis (50% and 200%) is performed to evaluate the effect of the substitution.

Life cycle inventories often contain information that is too vague to use for impact assessment. For example, a measure of volatile organic substances, or of unspecified petroleum compounds is essentially useless for the purpose of impact assessment. This represents another kind of “missing data” in the life cycle inventory. Until better information is made available for inventories, this is not an issue that can be addressed, except to note that it is real.

In no case may missing data be replaced by economic input-output data.

Life Cycle Impact Assessment

Life Cycle Impact Assessment calculates indicators of the impacts of a product or service on known environmental issues. The method does not calculate actual impacts, but is a measure that is believed to correlate to those impacts. For example, we know that climate change causes sea level rise and acidification as well as droughts and floods, but the measure we use is global warming potential in CO_2 equivalents, also known as the carbon footprint. This is a measure of the radiative forcing of a given emission. Life cycle impact assessment measures the impacts due to a single product or service, and this is often tiny relative to the overall environmental effects. Environmental impacts are all local, but usually, a life cycle assessment does not provide site-specific data, and it is unknown where the expected impacts occur. Finally, only environmental issues that are well-understood enough to model can be evaluated in a life cycle assessment. As scientific knowledge of the environmental improves, LCAs improve.

The value of LCIA is that it provides indicators of all the relevant impacts at once, and relates them to a product or service. In the case of this product category rule we are looking at the impacts of the production and consumption of a single entrée and the environmental impact of that entrée are small, and this analysis does not allow us to point to any given local environmental effect and ascribe it to the consumption of that entrée. However, in aggregate, we know that our consumption of food has a very large impact on the planet.

The impact categories and models used in this analysis are shown in the table below. The justification for these models and their limits and validity are described in detail in Schenck et al. (2008).

Figure 3 Impact Categories and Models

Impact Category	Model
Climate Change	IPCC 2007-100 year
Stratospheric Ozone Depletion	Montreal Protocol
Acidification	Hydrogen ion production
Eutrophication	TRACI
Photochemical Smog	TRACI
Ecotoxicity	USE-tox equivalent
Water Resource Depletion	Net freshwater use
Mineral Resource Depletion	Mineral use for reserves<200 years
Fossil Fuel Depletion	Guinée et al.
Land use/biodiversity	Area occupied
Soil Depletion.	Mass of soil lost from site

Besides the impact categories required by ISO 14025, we have included toxicity, water resource depletion, soil depletion and land use/biodiversity. These impact categories are important because they speak directly to issues of food production: the use of pesticides, water and soil and loss of habitat to agriculture. To put these in context, fifty percent of US freshwater resources are used for irrigation of crops, and tillage induced loss of soil has been an issue in the US since the times of the dust bowl, when in 1935, the Soil Conservation Service was formed (now the Natural Resources Conservation Service). Finally, there is a growing awareness that the presence of native and near-native ecosystems provide substantial ecosystem services to the public. Forests, for example, have about twice the primary productivity as do fields. Displacement of these ecosystems is a global problem, with about 0.5% of global forests disappearing to agriculture every year, according to the Food and Agriculture Organization of the United Nations.

Unfortunately, there is no consensus on how best to model these impacts. Thus, we have chosen for the most part to model them using inventory indicators, with the exception of ecotoxicity, which we have chosen to report using the USE-tox ecotoxicity model, as automated at www.iere.org/lca-tox.

This model calculates partitioning of toxic substances among air, water, soil and sediment compartments, then calculates their lifetime in each compartment. The weighted average lifetime is multiplied by its toxicity to aquatic organisms (as measured by the concentration at which half of a sensitive species dies) and by a bioconcentration factor. The resulting indicator has units of m^3-years, and can be thought of as the amount of water polluted for one year to the level at which half of at least one species population dies.

This model is limited because it only calculates indicators for the most toxic metals (those that are regulated in the USA under the clean water act or the safe drinking water act). It does have the virtue of being able to calculate the indicator result for all organic substances as long as they are uniquely identified.

There is little consensus around indicators of human toxicity, in part because there are so many potential endpoints in human health that substantial value judgments are required. The USE-tox ecotoxicity model is based on a single endpoint (mortality of the most sensitive known aquatic species). We use it here as a proxy for human toxicity.

Soil losses are estimated for agricultural and silvicultural activities using the Revised Universal Soil Loss Equation, as modeled by the USDA. Land use is calculated for agricultural and silvicultural activities only, using the most recent data on yields from the USDA statistical studies. We have ignored the land use of the other unit processes because they are anticipated to be very small.

LCIA Results

LCIA results should be shown in two tables using the format below.

Figure 4 LCIA Profile

Impact Category	Units per Functional unit	Indicator Result
Climate Change	kg CO_2 eq	
Stratospheric Ozone Depletion	kg CFC-11 eq	
Acidification	H^+ moles eq	
Eutrophication	kg N eq	
Photochemical Smog	kg NOx eq	
Ecotoxicity	m^3-yrs	
Water Use	L water	

Impact Category	Units per Functional unit	Indicator Result
Mineral Resource	gm minerals	
Fossil Fuel Depletion	MJ eq	
Land Use/Biodiversity	m^2 land occupied	
Soil Depletion	gm soil	

The mineral resource depletion detail should be shown in a table as below. Note that the sum of this table must match the mineral resource depletion figure as above.

Figure 5 Mineral Resource Depletion

Mineral	Unit	Amount
Aluminum	mg	
Copper	mg	
Etc….	mg	
Total	**gm**	

In both cases the tables should not show more than two significant figures.

Interpretation of Results

It is important to understand the sources of environmental impacts across the life cycle. These should be represented in a contribution analysis showing the following life cycle stages:

- Packaging
- Processing
- On-farm production
- Cooking to serve
- Transport and retail

The report should discuss the distribution of impacts among the life cycle stages, explaining them to the reader. Obvious opportunities to improve should be pointed out.

Data Quality Assessment

This section must identify any place where the data did not meet the data quality guidelines, along with an analysis of the importance of this variance from the guidelines. Where substitute data sets are used (one crop for another) it must be noted here.

It should provide an estimate of the error bars on each of the major impact category results. Where information about the statistical variability of the results are available (e.g. in the USDA survey data), they should be mentioned.

References

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US National Renewable Energy Laboratory. US LCI Database http://www.nrel.gov/LCI

USDA Forest Service 2008. Ecosystems Services. http://www.fs.fed.us/ecosystemservices/

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USEPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI) http://www.epa.gov/nrmrl/std/sab/traci/

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PCR Review

April 10, 2009

Critical Review of Earth sure Packaged Single Entrée Draft Product Category Rule

By Lise Laurin, EarthShift, Michelle Barry, The Hartman Group, and Bob Lilienfeld, The Cygnus Group.

The team reviewed the Draft Product Category Rule (PCR) as requested by IERE. We have several concerns with the PCR as written.

1.	Unclear Rules: The PCR is written as an example LCA, not as a prescriptive document. It is unclear which items refer to this LCA study specifically and which are to be used for all EPDs. We would recommend rewriting this document to show the rules very prescriptively up front, with the LCA as an appendix. (See http://www.environdec.com/pcr/pcr0508_e.pdf for an example of a PCR that is clear and easy to follow.)
2.	If you are intending to analyze both room temperature storage and frozen entrees with the same PCR, then the functional unit needs to be explained differently
3.	Under "Scope", desserts is misspelled.
4.	Under "Scope", it is not clear how animal husbandry is included. Are methane emissions from livestock to be included or excluded? What about the energy required to milk cows for dairy production? Etc.
5.	Also under "Scope," it is not clear whether this specification is applicable to more extensive offerings (like a "TV dinner")
6.	Under Scope¸ Cutoff rules, "initial inclusion of any material or energy representing at least 1% of the system" should specify "by mass or by energy, respectively," or should specify "of impacts".
7.	Under "Data Collection Procedures" I would recommend some kind of data quality indicator on the spreadsheet. While it won't necessarily make a difference in the EPD, it will give the company an idea of where their uncertainty is and may help if reviewers dispute their results or if their results are significantly different from another manufacturer for example. (And it helps in the overall understanding of LCA).
8.	Under Unit process description, Electricity production, there is a typo: ". . . regional information is known, data from the regional grid *is known*" (should be "is used").
9.	Someplace, either in Scope or under Data collection, there should be guidance as to what must be primary data and what should be primary data.
10.	Commodity foods production: there should be an option for free range and organically raised livestock production to use modeling that does not assume the animals are

confined. There should also be guidance for crops not available from the USDA dataset.
11. Packaging materials production and package production should be combined. Also, packaging waste treatment should be specified (included or excluded) at some point (it appears to be excluded, as it is not part of the unit process from the creation of packaging materials to the point where the package is ready to fill.
12. Under Waste, recycled materials are treated as avoided burden. It should be specified under packaging materials production that all materials should be modeled as virgin, including recycled materials.
13. Missing data—do you allow input output data for missing data?
14. Human toxicity—provide better information on how ecotoxicity is a proxy for human toxicity. I recommend that you require the EPDs to include a statement that ecotoxicity is being used as a proxy for human toxicity.
15. Infrastructure and land use outside of agriculture: at some point, there should be a study to see exactly how small these are. A quick calculation of rape seed oil production with and without infrastructure shows a significant difference in toxicity (especially carcinogens) and mineral extraction, but supports your decision in the other categories.
16. Unit process descriptions: Guidance should be given on how to model retail. Two different groups within the same company modeled retail and got two orders of magnitude difference in the CO2 emissions.
17. Climate change: specify most recent IPCC 100 year model
18. The EPD appears to be in the middle of the PCR, is that purposeful? If so, maybe you could make it a PDF and insert it as a picture in your document so it is clear that purposeful? If so, maybe you could make it a PDF and insert it as a picture in your document so it is clear that you are still in the PCR.
19. Critical Review: Michelle Barry's company is the Hartman Group (one "n").

Responses to Review

Responses to the review are shown in the table below.

1. Unclear Rules: The PCR is written as an example LCA, not as a prescriptive document. It is unclear which items refer to this LCA study specifically and which are to be used for all EPDs. We would recommend rewriting this document to show the rules very prescriptively up front, with the LCA as an appendix. (See http://www.environdec.com/pcr/pcr0508_e.pdf for an example of a PCR that is clear and easy to follow.)	The document was divided into two, clearly separating the PCR from the LCA developed for the EPD
2. If you are intending to analyze both room temperature storage and frozen entrees with the same PCR, then the functional unit needs to be explained differently	The language of the functional unit was changed, and the time period of the functional unit shortened to address this concern
3. Under "Scope", desserts is misspelled.	Corrected
4. Under "Scope", it is not clear how animal husbandry is included. Are methane emissions from livestock to be included or excluded? What about the energy required to milk cows for dairy production? Etc.	Language specific to animal husbandry was expanded and clarified.
5. Also under "Scope," it is not clear whether this specification is applicable to more extensive offerings (like a "TV dinner")	Language clarified to exclude TV dinners.
6. Under Scope, Cutoff rules, "initial inclusion of any material or energy representing at least 1% of the system" should specify "by mass or by energy, respectively," or should specify "of impacts".	Corrected.
7. Under "Data Collection Procedures" I would recommend some kind of data quality indicator on the spreadsheet. While it won't necessarily make a difference in the EPD, it will give the company an idea of where their uncertainty is and may help if reviewers dispute their results or if their results are significantly different from another manufacturer for example. (And it helps in the overall understanding of LCA).	Excellent idea—will include it in spreadsheets.
8. Under Unit process description, Electricity production, there is a typo: ". . . regional information is known, data from the regional grid *is known*" (should be "is used").	Corrected.
9. Someplace, either in Scope or under Data collection, there should be guidance as to what must be primary data and what should be primary data.	Language added to clarify this point
10. Commodity foods production: there should be an	If there is alternative raising, then

option for free range and organically raised livestock production to use modeling that does not assume the animals are confined. There should also be guidance for crops not available from the USDA dataset.	the livestock will not be a commodity. Language was strengthened to show this, and also to show how to choose substitute crops.
11. Packaging materials production and package production should be combined. Also, packaging waste treatment should be specified (included or excluded) at some point (it appears to be excluded, as it is not part of the unit process from the creation of packaging materials to the point where the package is ready to fill.	The materials production data is derived from national datasets, and the packaging production is derived from primary data, so these two unit processes remain separate. The language has been sharpened to clarify data source, and that the waste is affiliated with the packaging unit processes.
12. Under Waste, recycled materials are treated as avoided burden. It should be specified under packaging materials production that all materials should be modeled as virgin, including recycled materials.	Recycled materials are only treated as displacing virgin for the purpose of system boundary expansion—it likely represents open-loop recycling, so this suggestion, while interesting is not taken up.
13. Missing data—do you allow input output data for missing data?	No- language has been added to make that clear.
14. Human toxicity—provide better information on how ecotoxicity is a proxy for human toxicity. I recommend that you require the EPDs to include a statement that ecotoxicity is being used as a proxy for human toxicity.	Extended description has been added.
15. Infrastructure and land use outside of agriculture: at some point, there should be a study to see exactly how small these are. A quick calculation of rape seed oil production with and without infrastructure shows a significant difference in toxicity (especially carcinogens) and mineral extraction, but supports your decision in the other categories.	I agree. The issues of land use are hugely important and seem to finally be getting attention.
16. Unit process descriptions: Guidance should be given on how to model retail. Two different groups within the same company modeled retail and got two orders of magnitude difference in the CO2 emissions.	Done.
17. Climate change: specify most recent IPCC 100 year model	Done.
18. The EPD appears to be in the middle of the PCR, is that purposeful? If so, maybe you could make it a PDF and insert it as a picture in your document so it is clear that purposeful? If so, maybe you could make it a PDF and insert it as a picture in your document	Corrected through the creation of a separate document..

so it is clear that you are still in the PCR.	
19. Critical Review: Michelle Barry's company is the Hartman Group (one "n").	Corrected