

How Eco-Design and PCF create efficiency in agri-food products and supply chains

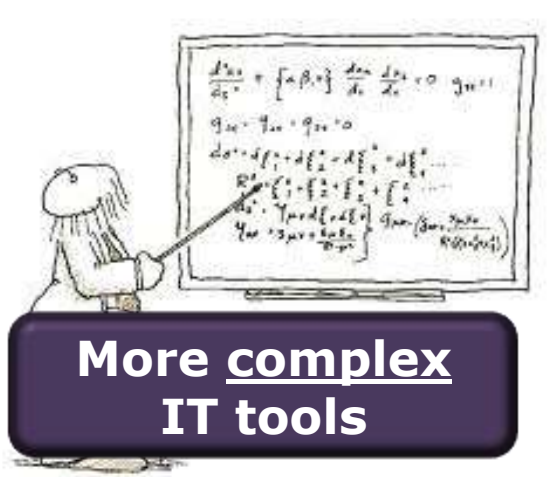
Ricardo Teixeira
Bluehorse Associates





Research agri-food LCA

Business applications



**More complex
IT tools**

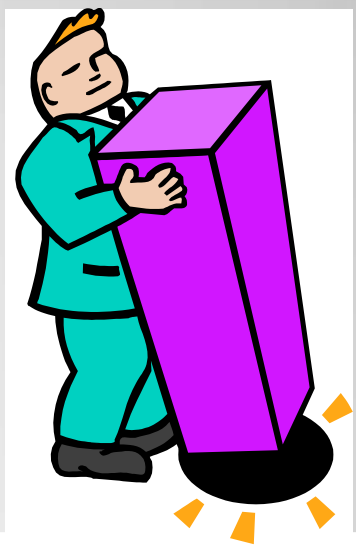


**More simplified
IT tools**



- Mode of production
- Inputs
- Machinery
- Local conditions
- Allocation
- ...

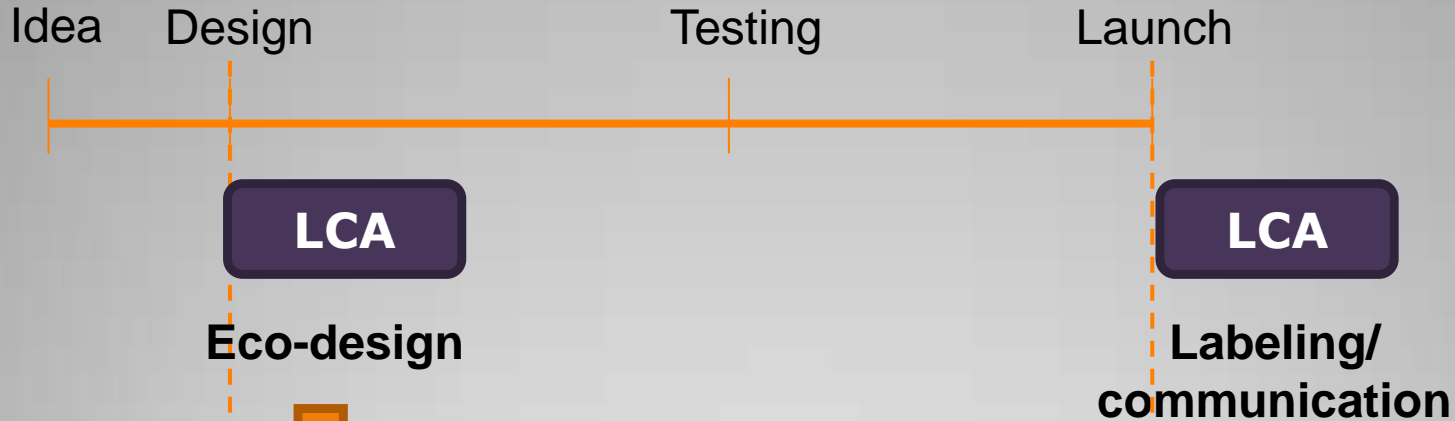
1.135678
(kg CO₂e/kg)



Context



Product timeline



LCA timeline



Introduction



- Need for simplified methodologies – quick assessment:
 - Eco-design
 - because it may take longer to run a full LCA than for a product in the food sector to be launched
 - Eco-labeling
 - because there will be many products to analyse each year when a scheme is put into play.

Introduction



Product timeline

Idea Design Testing Launch

LCA

Eco-design



Simplified LCA timeline

Objective and scope Data collection and iterative analysis Revision Discussion

Introduction



- Simplified methods in LCA
 - First quick assessment of the product chain
 - Eliminate assumptions
 - The myths of packaging and food miles
- But are results from simplified methods accurate?
 - Simplification of ISO unit-flow methodology
 - Relying almost exclusively on secondary data
- Example – Product Carbon Footprint (PCF) in the agri-food sector

Simplification



A Survey of Life Cycle Assessment Practitioners with a Focus on the Agri-Food Sector

Ricardo Teixeira and Sara Pax

Five years have passed since the survey of life cycle assessment (LCA) practitioners in North America was conducted by Cooper and Fava (2006). During this period, new methodologies have become mainstream (e.g., consequential LCA for goal and scope definition; hybrid LCA using input-output tables) (Finnveden et al. 2009), while LCA business applications are also becoming commonplace, as shown by recent product labeling initiatives by retailers (Clare and Little 2011) and the labeling program set by the French government (ADEME 2011).

There is also a sense that more events with high attendance are taking place, more LCA and industrial ecology courses are being offered, and more LCA tools are available. This rapid evolution suggests the need for an update of the survey. This article compiles the

Despite much effort being put in the last five years in obtaining more data and developing tools, data gathering and the quality of databases still worries the LCA community. On the one hand, there are difficulties in collecting primary data, and on the other hand there is lack of and suspicion about the quality of secondary data.

The survey was conducted using the Web platform SurveyMonkey™ (<http://www.surveymonkey.com>) between February 10, 2011, and March 25, 2011.¹ The survey was distributed in the PRé Consultants LCA discussion list and sent by email to the Bluehorse Associates (BHA) mailing list. BHA is a sustainability metrics company specializing in the food industry, so a large portion of the replies were from LCA practitioners in agriculture and food. We acknowledge this inherent bias and interpret the results accordingly.

Characterization of the Sample

A total of 117 LCA practitioners answered at least one question in the survey ($N = 117$). Because the survey is not statistically representative of the whole population of LCA practitioners, we

Main barriers to LCA:

Time and resources to collect primary data

Quality and availability of secondary data

Why focus on data



Average numbers



2.5
(kg CO₂e/kg)

Simplified LCA



Magic numbers

~ 1
(kg CO₂e/kg)

Research agri-food LCA



1.135678
(kg CO₂e/kg)



- Appropriate level of detail
- Non-expert use
- Quick and massive use

Objective

Agri-food business LCA



Magic numbers

~ 1
(kg CO₂e/kg)



To find them we need:

- Large enough database
- Many representative sources

$N \uparrow \Rightarrow \varepsilon \downarrow$

Objective

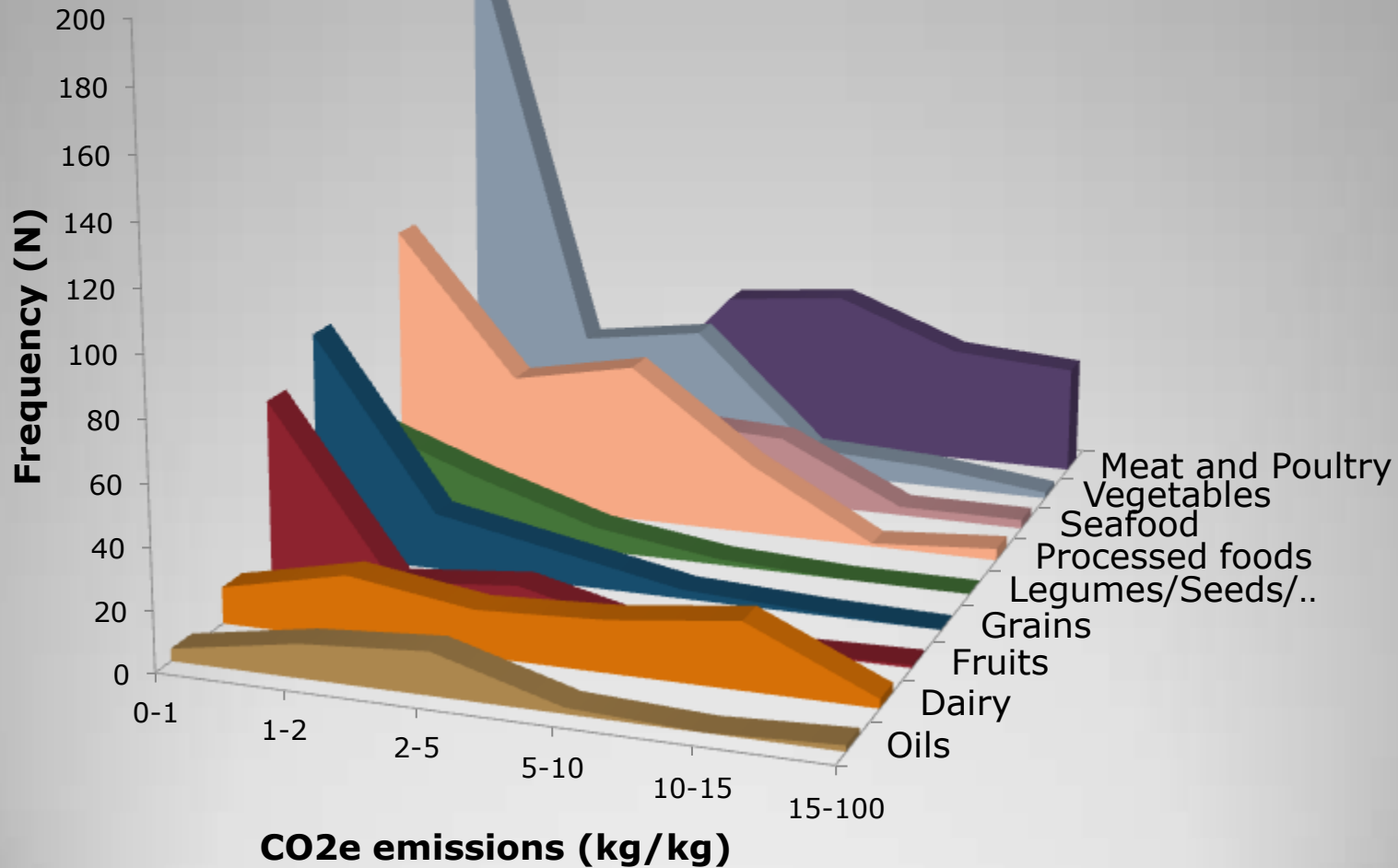


Developed by:

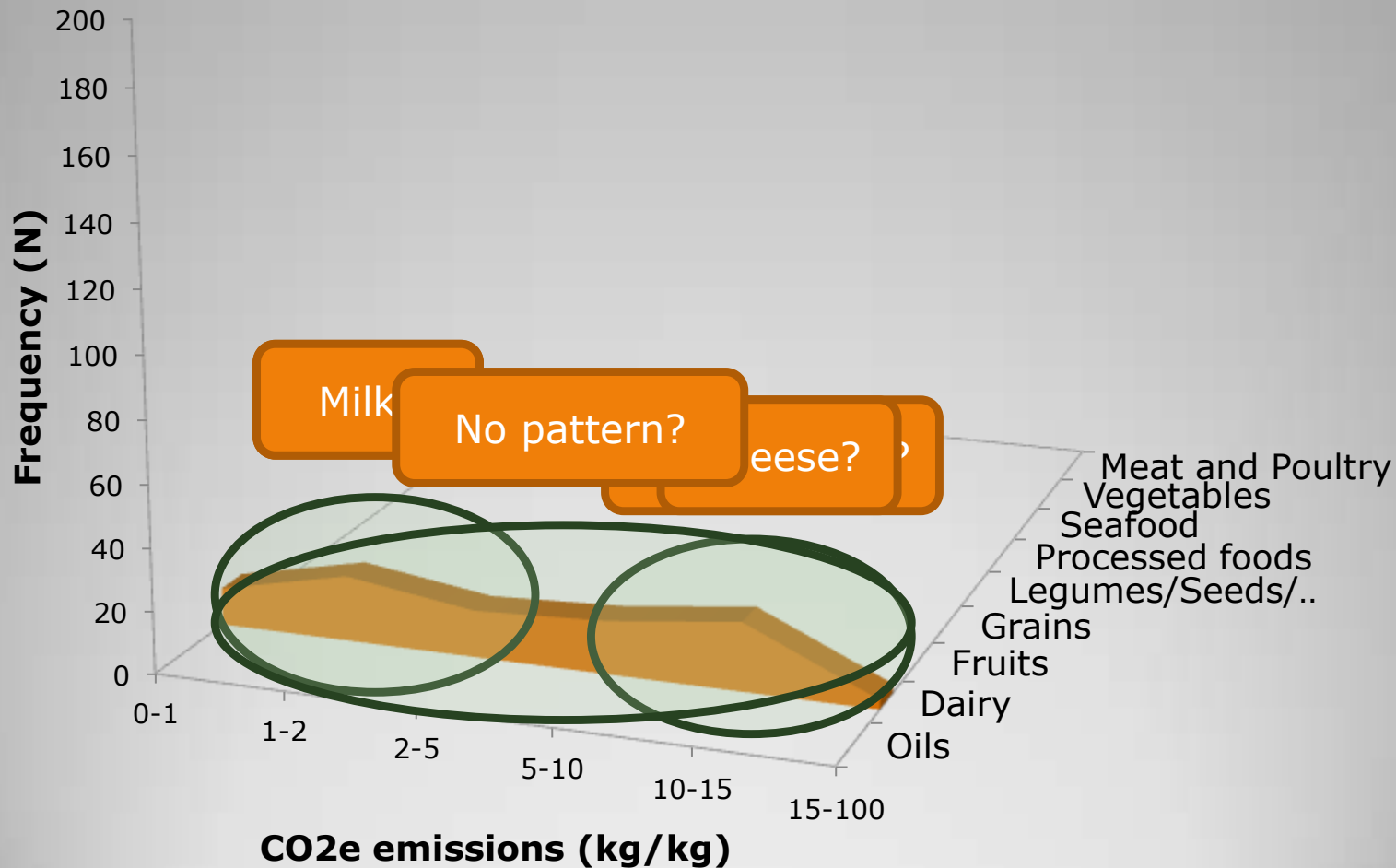


Statistical analysis of the Carbonostics database

- 1,500 pre-recorded cradle-to-gate CO₂e emissions records (food)
- ADEME, CleanMetrics, CLM, the Danish LCA Food Database, DEFRA, ecoinvent, ESU, etc
- Peer-reviewed and validated by Thomas Kagi at the Swiss NGO MyClimate
- Accredited by the Supply Chain Carbon Council



Available data



Breaking down the impacts



Cluster analysis

- 1st level (dairy, fruits, ...)
- 2nd level (group-specific)
- 3rd level (product-specific)



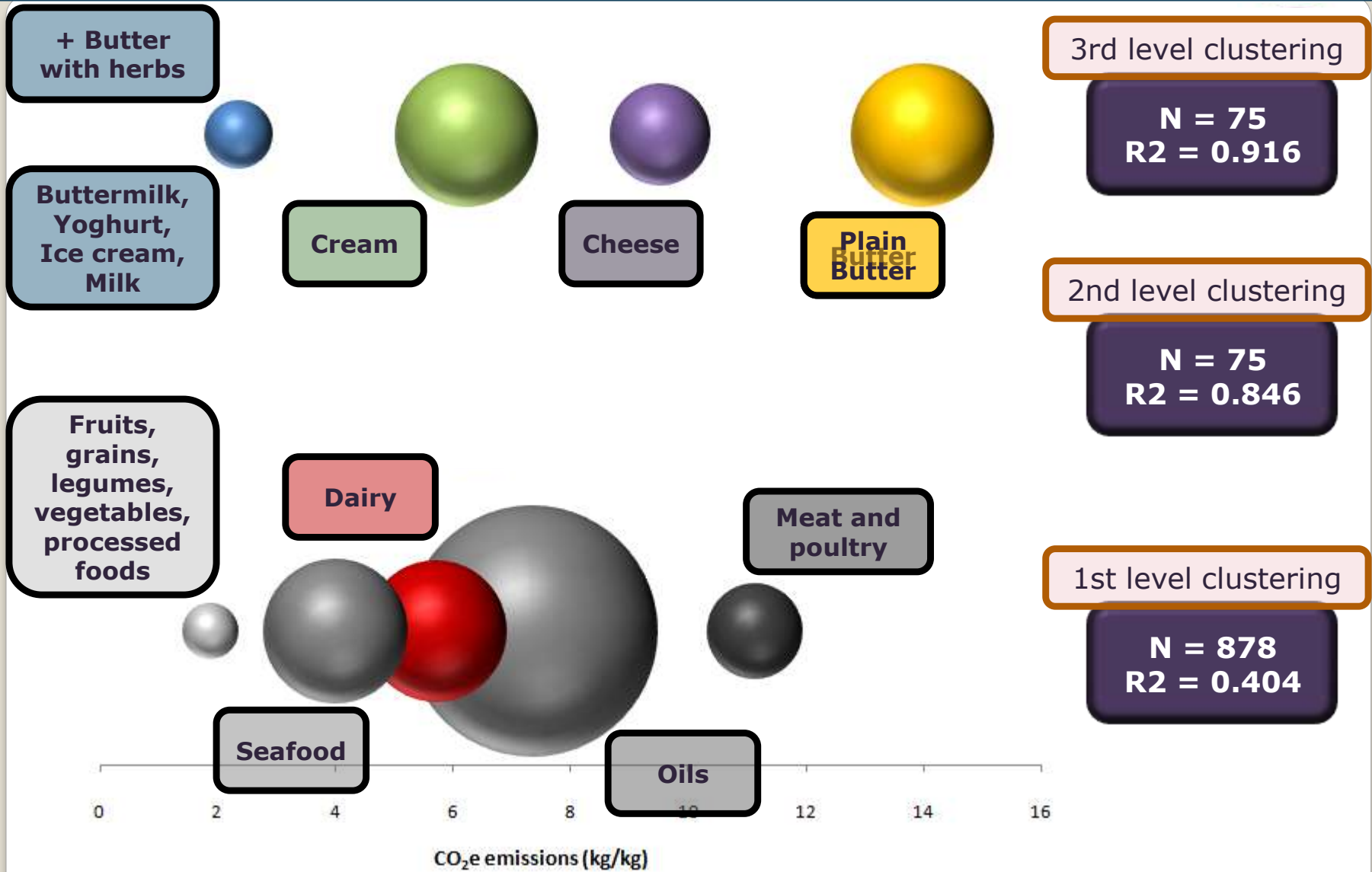
Transversal control variables:

- Production method (conventional, organic, ...)
- Geographical region

Statistical analysis

Regression model for each clustering level

Methodology



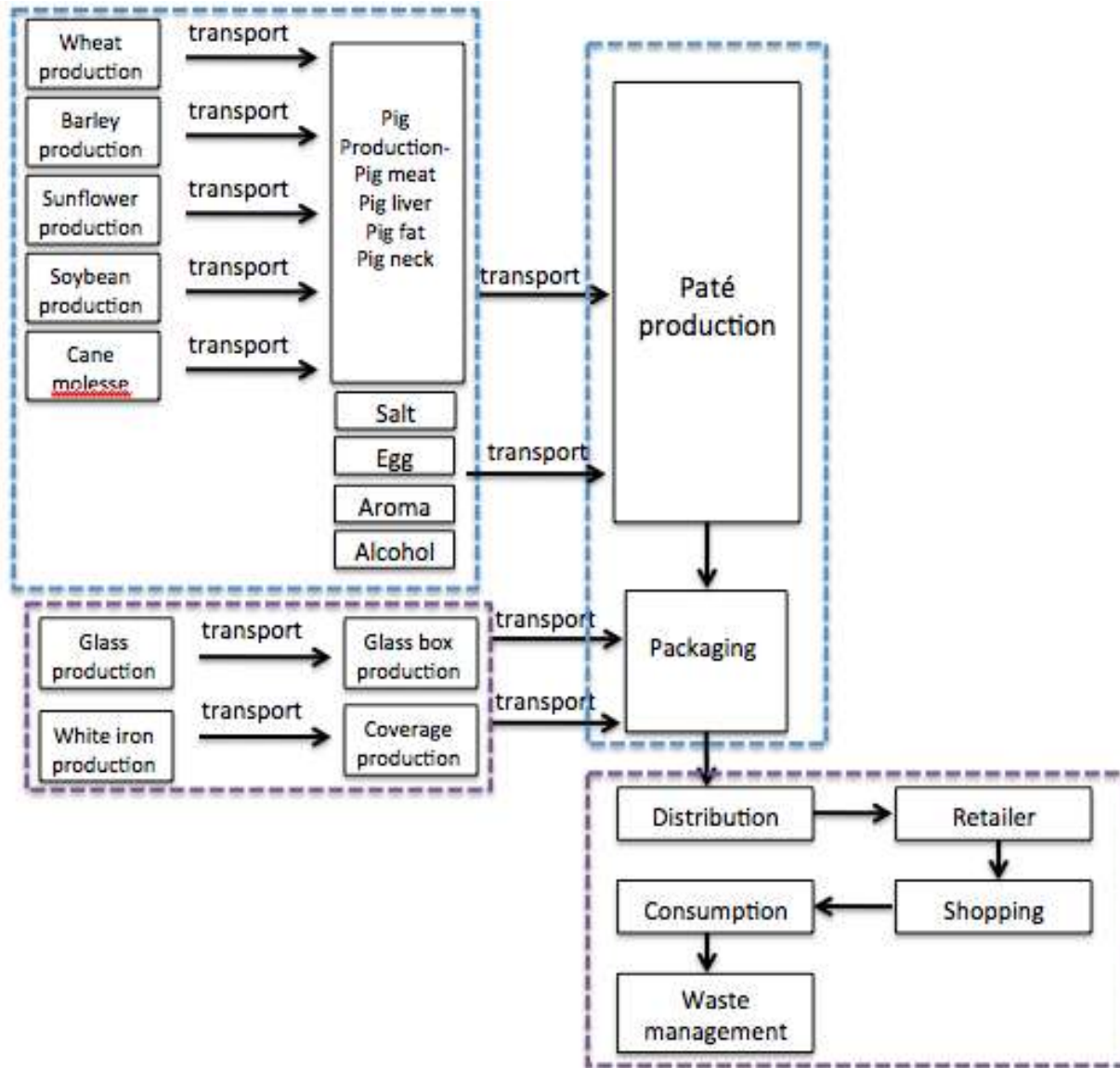
Results (conventional, Europe)



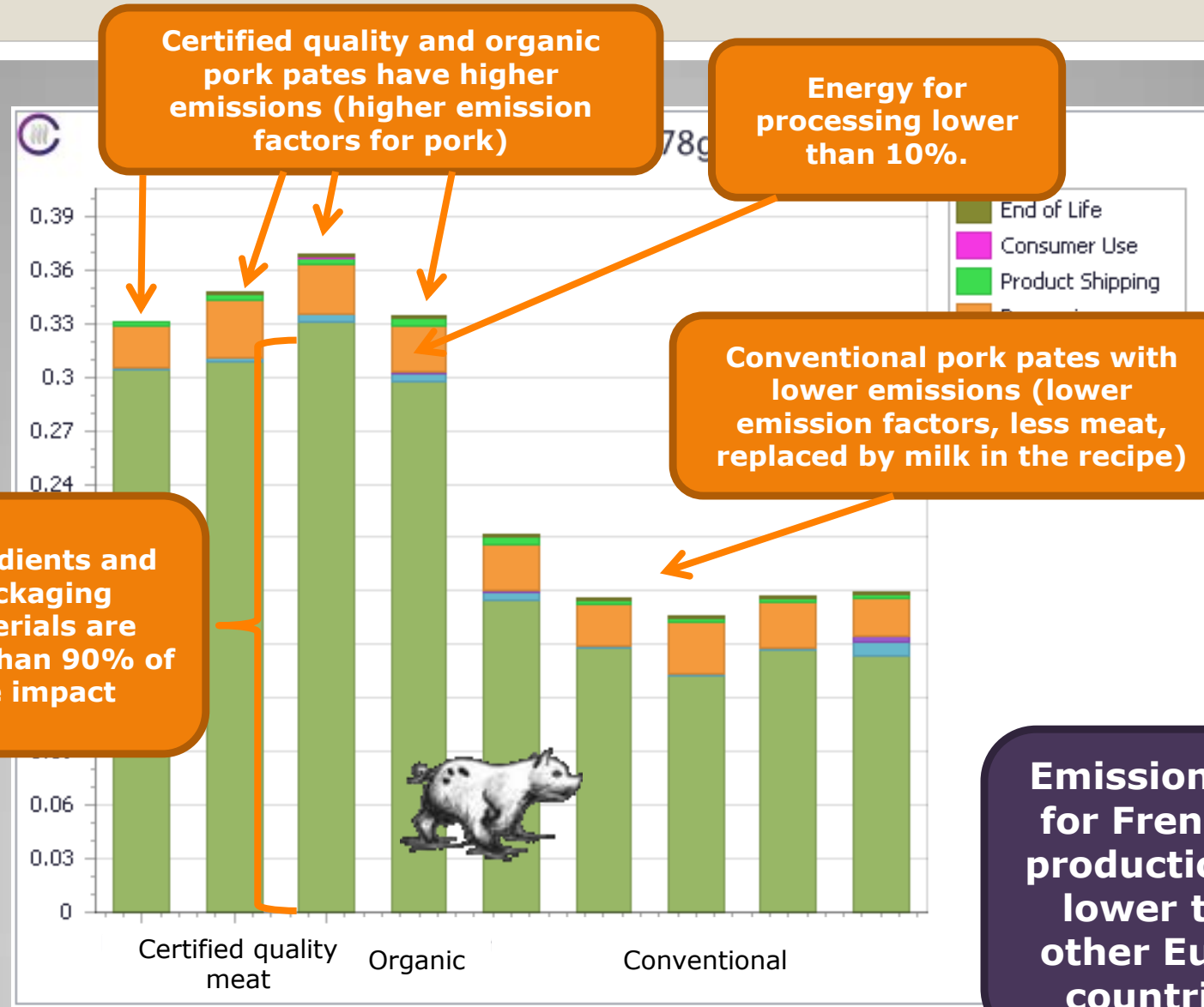
- Application of data at this level of detail to products produced by **Hénaff** – the leading French meat (pork) products manufacturer
- Indicators studied:
 - CO₂e emissions
 - Nutrition
 - Calories
 - Protein
 - Fat
 - Carbs
 - Sodium
 - Sugar



Example: Hénaff Paté



System borders



Ingredients and packaging materials are more than 90% of the impact

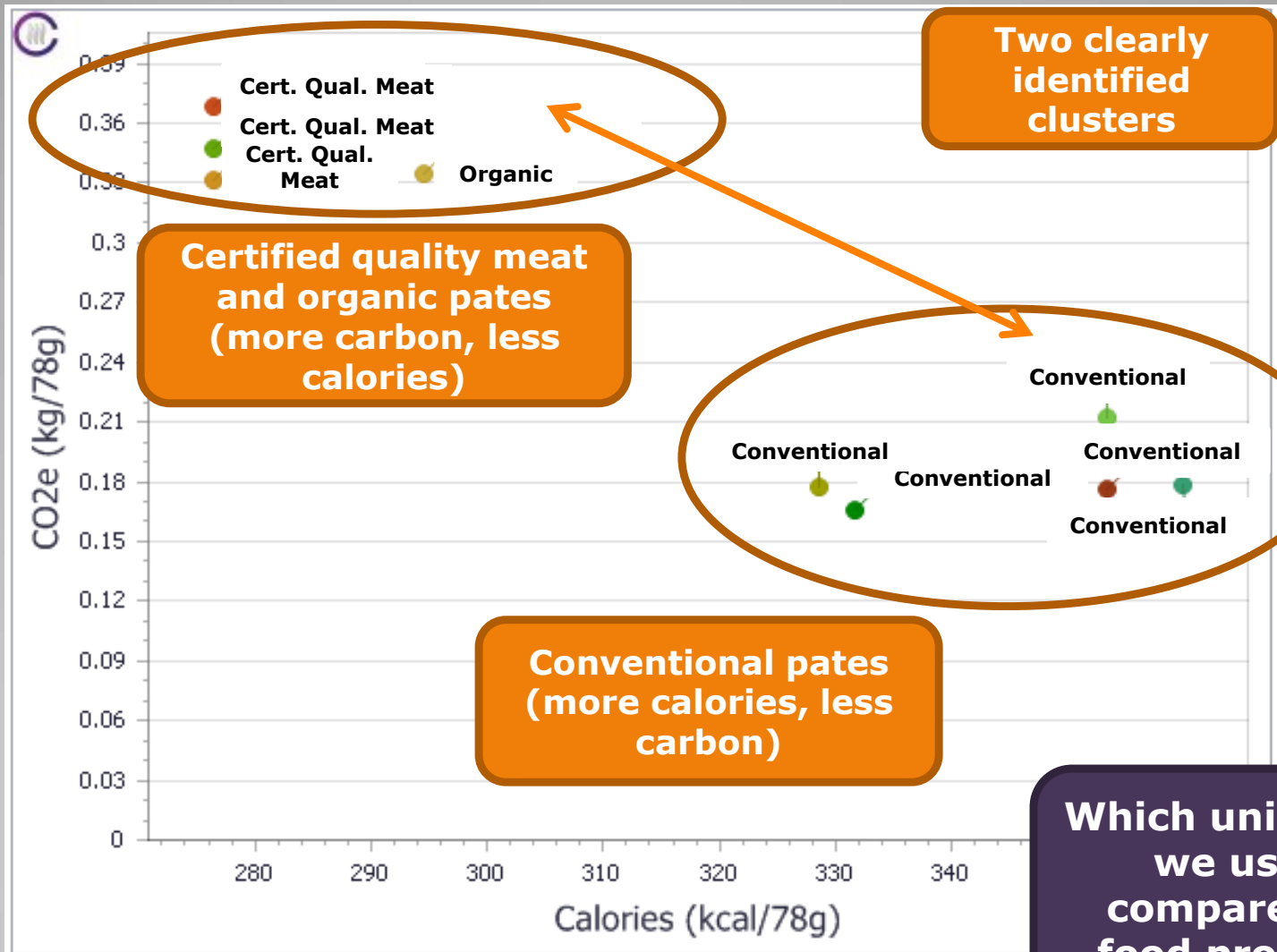
Certified quality and organic pork pates have higher emissions (higher emission factors for pork)

Energy for processing lower than 10%.

Conventional pork pates with lower emissions (lower emission factors, less meat, replaced by milk in the recipe)

Emission factors for French pork production much lower than in other European countries (?)

LCA results – different pates

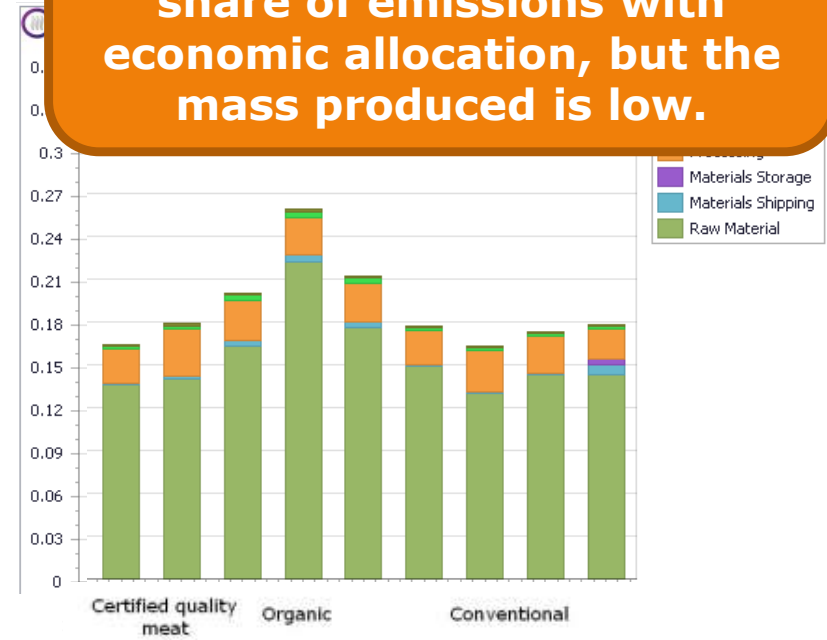
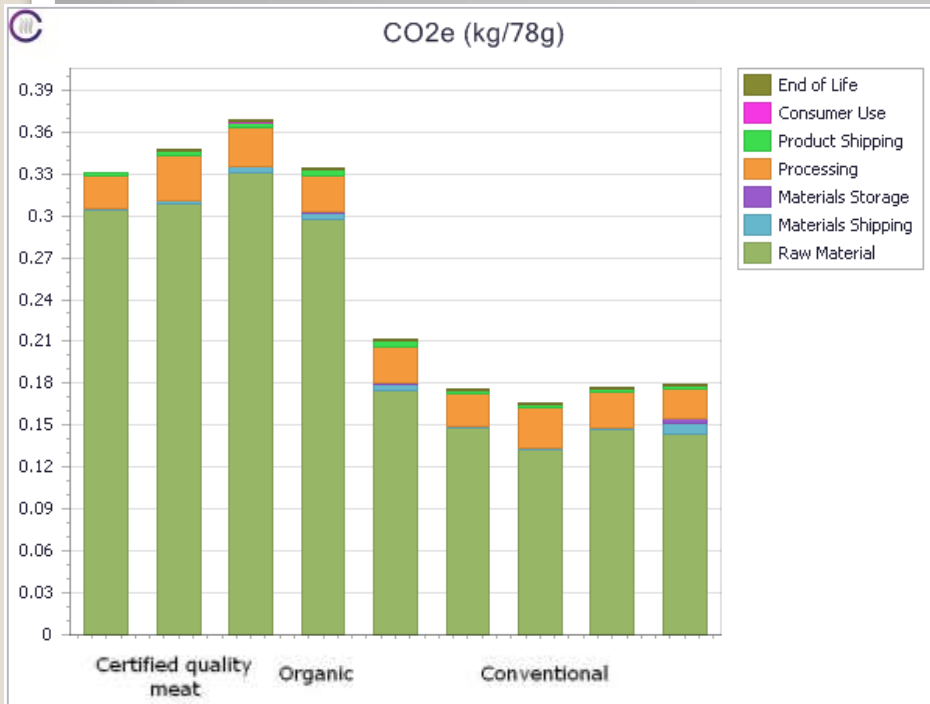


Comparing carbon and calories



- Relative results change depending on allocation for pork parts

Cause: some "noble" pork parts are allocated a higher share of emissions with economic allocation, but the mass produced is low.



Economic allocation

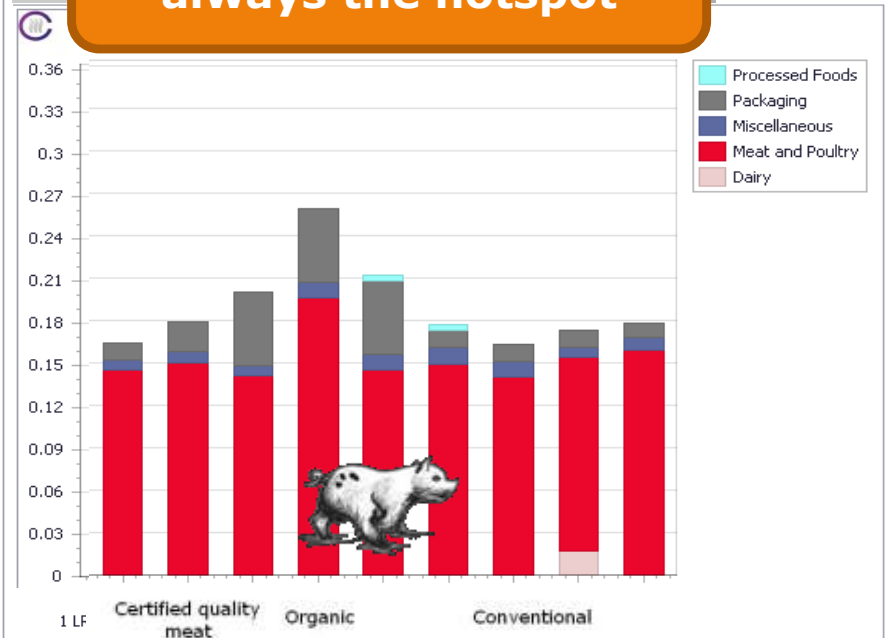
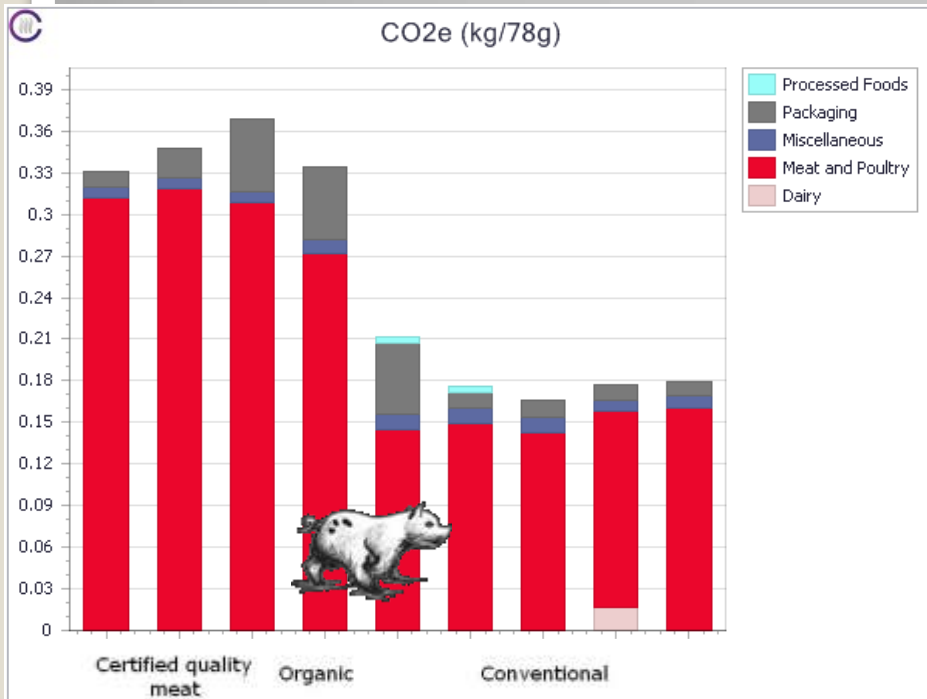
Mass allocation

Methodological challenges



- But qualitative results do not depend on allocation

Pork meat parts are always the hotspot



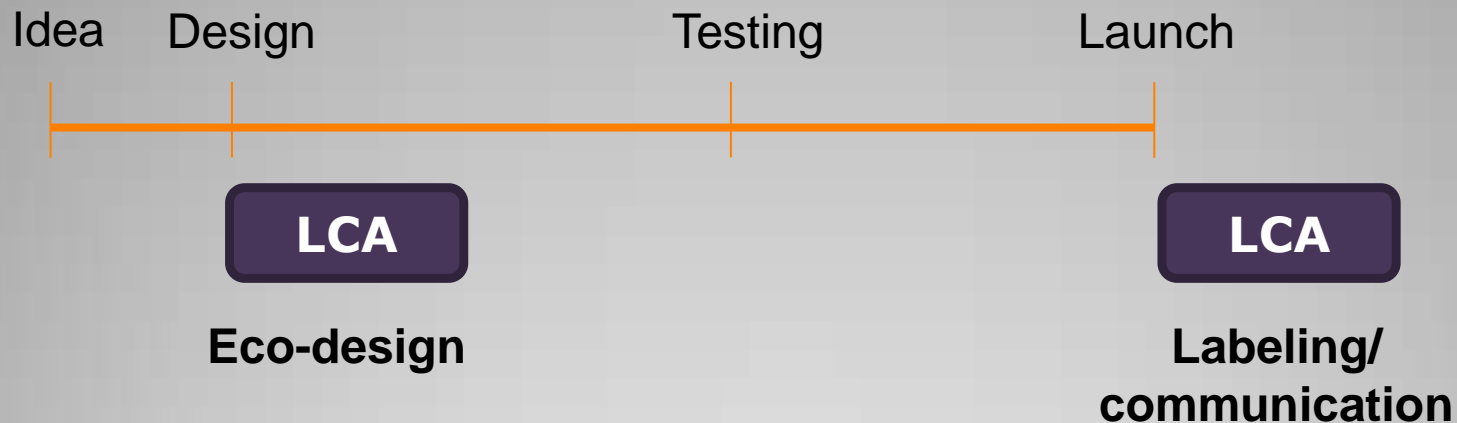
Economic allocation

Mass allocation

Methodological challenges



Product timeline



Good data, good
business value

Standards will
have to set
methodological
choices in stone to
prevent disparities
(e.g. allocation)

Methodological sensitivity



- There is enough data to use simplified PCF methods in eco-design if data is selected using the correct level of detail
 - For pork parts, that detail is highly specific
- However, for a high-level analysis, conclusions are often invariant (ingredients, mostly pork meat, as hotspot)
 - So, depending on their objectives, companies like Hénaff can leverage value and insights (e.g. optimize pork meat production, change meat types)

Conclusions

Thank you!

Questions? Comments? Let's chat!

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