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BaGaTel: an ontology driven database to ecodesign food products taking into account their nutritional and sensory qualities

Abstract *
Please enter an abstract of your paper (max 4000 characters, spaces, tables and literature included).
Additionally one figure is allowed.
Please follow the structure: Problem and Aim, Methods, Results, Discussion/Interpretation, Literature.

Problem and Aim
Multicriteria assessment of agrifood systems is essential in eco-design approaches aiming to improve sustainability of food value chains. Environment, nutrition, and sensory acceptance by consumers are key criteria. With this purpose, collection and management of data on agrifood system activities are of primary importance. There is a real need of tools to structure, store and share data related to the transformation of agricultural products into food, domain currently poorly documented.

Methods
A process and observation ontology in food science, PO² ontology [1], has been built to structure relational BaGaTel database in order to integrate data in the field of dairy products taking into account their environmental impact computed by LCA as well as their nutritional and sensory properties, using a consensual model and a shared structured vocabulary. Data from a total of 40 different projects (collaborative national/ European, publications, PhD theses, reports) have been integrated with their associated metadata (project information, link to publications, nature of the data, incertitude, process steps, materials, methods…). The metadata associated to each project, the list of the terms used in BaGaTel and a video tutorial, which presents the data entry interface and the visualization of data, are available on the NutriSensAl portal [2].

Results & Discussion/Interpretation
BaGaTel database was shown to be very useful to support Life Cycle Inventories (LCI) in the case of Comté cheese assessment [3]. A detailed process chart could be built, and guidance to data collection could be provided by querying the different projects in the database on available collected data for LCA (e.g. electricity consumption, liquid wastes…). LCA practitioner then has to consider if these data are relevant for its system, and if other similar data have to be included. BaGaTel database was also successfully used to estimate quantified data on electrical consumptions, by querying the data available for the materials (power of equipment) and methods (duration of process stages) used.
When LCA has been computed: inventory data and results can be stored in the BaGaTel database, together with all the corresponding metadata (e.g. system boundaries, functional unit, impact assessment method) necessary to eventually re-use them. Thanks to the fact that data on cheese quality, process and eco-design are in the same database, and that many projects and data are available, it is possible to estimate missing data on the environmental impact of projects only focused on food quality. Such an approach is very useful for knowledge and data capitalization, as well as to produce new knowledge and data by combining and integrating existing resources. Multicriteria assessment is obviously facilitated by such a database.
Our objective is now to combine the database with adequate tools to deliver open access data in accordance with FAIR principles (Findable, Accessible, Interoperable, Reusable). We are also working on the interoperability between BaGaTel and MEANS platform, which focuses on providing tools and database for LCA practitioners. MEANS-InOut software currently allows the description of farming practices for crop and livestock productions, inclusion of food processing will provide a major step towards sustainability assessment of agrifood systems.

Literature

[1] Ibanescu, Dibie, Dervaux, Guichard, Raad (2016). PO2- A Process and Observation Ontology in Food Science. Application to Dairy Gels. In: Metadata and Semantics Research, MTSR pp.155-165. Göttingen, Germany. (http://agroportal.lirmm.fr/ontologies/PO2_DG)

[2] ANR-IC-Qualiment-NutriSensAl (http://plasticnet.grignon.inra.fr/PortailNutriSensAl/).

[3] Pénicaud, Ibanescu, Allard, Fonseca, Dervaux, Perret, Guillemin, Buchin, Salles, Dibie, Guichard (2019). Relating transformation process, eco-design, composition and sensory quality in cheeses using PO2 ontology. International Dairy Journal, 92, 1-10.

Keywords *

Please enter up to 5 keywords, separated by comma.

multicriteria assessment, data integration, ontology, open data

Authors and Affiliations *

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D) Challenges in modelling & data

-> Opening the data on food for LCA (databases, tools and software developments)