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Economic and environmental performances of French dairy farms: analysis combining economic and environmental databases

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Rationale and objectives of the work:

Dairy farms in France are highly diversified. This diversity relies on the size, degree of specialization and level of intensification (e.g. use of concentrate feed) (Depeyrot, 2017). To meet consumers' expectations and European Union agricultural policy (“green” payments of the first European pillar), dairy producers have to apply technical measures in an environmental perspective and, at the same time, work toward cost-effective sustainability. This study aims for better understanding of farmers' practices and the way they combine economic and environmental achievements in diversified and representative French dairy farms. For this purpose, we combined two databases: the French Farm Accountancy Data Network (FADN, 2018) and French Life Cycle Inventory (LCI) database AGRIBALYSE (ADEME, 2018) and calculated economic performances and environmental impacts using LCA. The two databases reflect well the diversity and variability of French dairy farms from economic and environmental points of view, respectively.

Approach and methodology:

FADN provides technical and economic indicators for a sample of farms representing most types of farming systems in the European Union, including France. FADN is adapted to understanding the manner in which farmers combine production factors and other technical resources to achieve value-added economic results. AGRIBALYSE contains LCIs for agricultural products (ca. 70 crop products and 70 animal products) in France. It is generated by the MulticritEria Assessment of Sustainability (MEANS) platform (Auberger et al., 2015). AGRIBALYSE describes the LCI of each product as natural resource depletion and pollutant emissions. After applying the ReCiPe Life Cycle Impact Assessment method using SimaPro software, we coupled the two databases, multiplying each crop and animal product of farms in FADN by the per-mass-unit environmental impacts of the corresponding product in AGRIBALYSE. The results offer a profile of economic indicators and environmental impacts for each farm. For this study, we classified dairy farms according to their production of animal fodder (maize silage and grass). We then compared their rate of value added, rate of natural resource depletion and level of each environmental impact per unit of value added, using unit of value added as the functional unit (Salou et al., 2016; van der Werf and Salou, 2015).

Main results:

The main results show that, based on national averages, mountain dairy farms that maximize the production of grass have a higher rate of value added, but a higher level of climate change impact per unit of value added. Lowland farms with a large percentage of silage maize in the fodder surface area have a higher rate of value added and a lower level of climate change impact per unit of value added. In contrast, farms with a low percentage of silage maize (i.e. 5-10%) in the fodder surface

area have a low rate of value added and a high level of climate change per unit of value added.

Discussion and conclusion:

Combination of the French FADN and AGRIBALYSE databases allows farm strategies (intensification levels) and objectives (autonomy, resilience, profit) and their associated environmental and economic performances to be identified. This approach highlights bottlenecks and allows the identification of key technical or structural characteristics that could be changed to simultaneously improve economic and environmental performances adapted to each type of dairy farm. Several additional impact categories and economic indicators will be presented and discussed for a better understanding of trade off.

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