Multi-criteria assessment of farm sustainability in key European dairy production areas: a case study analysis

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Context / theoretical background / research questions

European dairy production faces many challenges related to economic, environmental, and social sustainability, with particular regard for the need to mitigate greenhouse gas (GHG) emissions. Sustainable dairy production requires system thinking which considers dairy production as a complex set of interdependent components (including, among others, feed production, animal health, animal housing, and manure management) embedded in a specific social context. Thus, tools are needed to better understand these interlinkages and identify synergies and trade-offs across sustainability aspects. This is a difficult task as the breadth and detail of data required for thorough farm sustainability assessments present a critical challenge for survey design and implementation. Moreover, measuring farm sustainability is a difficult task because of its multidisciplinary nature. This issue is aggravated by to the lack of readily available data in the environmental and social dimensions.

This research aims at developing a holistic approach for achieving greater economic, environmental, and social sustainability of dairy production systems in key European regions. We conduct a multi-criteria sustainability assessment across three sustainability dimensions, with a particular focus on the identification of GHG mitigation strategies. The study focuses on case study farms to collect in-depth data on dairy sustainability.

Methods

Sustainability indicators were selected to represent multiple aspects of dairy sustainability across the three sustainability dimensions. For each sustainability dimension, a group of about 10 experts from different European universities and research institutions was formed to build a set of suitable indicators. The choice of indicators was guided by three objectives, i.e., to best describe the main challenges faced by European dairy production systems, to point out synergies and trade-offs across sustainability aspects, and to help identify GHG mitigation strategies at the farm level. Moreover, special attention was drawn to the need of choosing indicators which can accommodate and represent the large variety of European dairy production systems.

Based on selected sustainability indicators, a list of data requirements was then developed to guide data collection in case study farms. Additional background information regarding farm and farmer characteristics was also added to the data template, with the purpose of comprehensively describing case study farms and helping understand obtained differences in sustainability performance.

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23 case study farms were selected in different key European regions including France, Germany, Greece, Ireland, Norway, and Poland. These farms were chosen to represent national dairy production systems and included experimental and commercial farms. Commercial farms were identified as specialised dairy farms according to the farm typology definition proposed by the European Union (EU) Farm Accountancy Data Network. More specifically, at least 65% of their relative standard output comes from the dairy enterprise.

After data collection, case study farms will be compared based on their sustainability performance in selected sustainability indicators, with the purpose of identifying potentials for improved farm sustainability. Options to optimise case study farms across sustainability aspects will be also proposed.

Results

The data collection is currently being undertaken.

We expect to observe substantial disparities in sustainability performance across case study farms based on current levels of farm management, and differences in socio-economic and biophysical conditions. As a result, we expect to identify synergies and trade-offs between sustainability aspects.

Conclusions

This case study analysis will overcome data challenges associated with thorough assessments of farm sustainability across the economic, environmental, and social dimensions. Overall, the study is expected to advance the level of knowledge on how to encourage synergies and resolve trade-offs across sustainability aspects on European dairy farms, notably when implementing GHG mitigation strategies.