Rethinking pasture-based ruminant systems towards a sustainable future

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Livestock systems, especially ruminants, are severely criticized for their negative impact on the environment and human health (i.e. increased risk of non-communicable diseases due to meat consumption). However, ruminants can be a valuable source of macro and micronutrients and contribute to important ecosystem services, such as nutrient cycling and preserving cultural landscapes. Both positive and negative aspects of ruminant systems are highly dependent on the type of farming system, its context and management. Irish beef production accounts for one-third of the economic agricultural output. However, there is growing concern regarding the sustainability of the Irish agricultural sector and their pasture-based ruminant systems. Environmentally wise, for instance, the contribution of agriculture to total emissions in Ireland is higher than in any other EU Member State. CH_4 and N_2O emissions, associated with pasture-based ruminants, are higher than the EU average. From an economic perspective, many cattle farms show low technical and economic performances. The main goal of this research is to explore the solution space for sustainable pasture-based beef and sheep farming systems in Ireland, to find a combination of sustainable systems that can simultaneously deliver meat of high nutritional value, provide relevant ecosystem services, be economically viable and environmentally sound. To this aim, we formulated four research questions: i) What are the most pressuring sustainability issues in the Irish ruminant sector? Interviews will serve to understand the views on the sector, the demands and expectations for it and potential development options. ii) Which beef and sheep livestock systems exist? Surveys and farm interviews will be performed and multivariate techniques will be used to distinguish between different farm types based on their management (e.g. production intensity, grassland management, sward techno-economic performance or capacity to deliver environmental services) iii) How should the demand for meat quality and nutrition be addressed? A multi-objective optimisation model (Farm-DESIGN) will be updated and expanded to better understand which indicators best describe meat nutritional quality, the effects of sward composition on it and potential trade-offs between this and other objectives at farm level. iv) What is the sustainable solution space for the array of pasture-based ruminant farming systems in Ireland? Using FarmDE-SIGN we will analyse optimised alternatives to current Irish beef and sheep farming systems and quantify the resilience of the proposed systems.