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Sustainability performance of innovative ruminant systems in Europe

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1. INTRODUCTION

European livestock systems are facing a set of sustainability challenges encompassing environmental (e.g., greenhouse gas emissions, biodiversity decline), economic (e.g., value creation, profitability), and social issues (e.g., labour conditions, animal welfare). To understand how livestock systems in Europe can become more sustainable, the Horizon 2020 PATHWAYS project works with groups of European livestock farmers, organised around sustainable innovation practices. To assess their performance and identify benefits and trade-offs of those practices, we performed environmental (E) and social (S) LCAs and economic analysis.

2. METHODS

Sustainability data was collected from four ruminant farms (beef and dairy) in the UK, Sweden, Romania and Germany, with an adapted version of the Public Goods Tool (PG tool) (Paraskevopoulou et al., 2020) and interviews with farmers. The E-LCA used the FarmLCA tool (Schader et al., 2014), that includes biodiversity and soil carbon impacts, following a systematic method review. The analysis adopted a cradle to farmgate boundary and included the functional units 1 kg liveweight of finished beef, 1 kg of energy corrected milk, hectare of land utilised, and unit of currency of livestock output. The S-LCA followed a reference scale approach and included five impact categories of the UN Environment Programme Guidelines for S-LCA (UNEP, 2020). The economic analysis included ten indicators, based on reporting variables in FADN standard results (EC, 2022).

3. RESULTS AND DISCUSSION

We present preliminary results of the UK beef system, those of the other systems will follow. E-LCA results show a relatively low carbon footprint per kilogram liveweight, compared to a recent UK estimate (McAuliffe et al., 2023). The biodiversity impact was positive, due to a lack of external feed reliance (Figure 1). S-LCA results are mixed, e.g., the beef system scores below a generally acceptable level for half of the assessed impact categories (Table 1). Economically, the beef system performed better than the average specialist UK cattle farm in FADN (Table 2).

4. CONCLUSIONS

It was shown that use of the FarmLCA tool, together with S-LCA and economic analysis, building on data from the Public Goods Tool allows for a holistic sustainability assessment of innovative livestock farms. The sustainability assessment of the UK case shows benefits, such as carbon footprint per kg liveweight, a low biodiversity impact, local employment, fair competition, and beneficial economics but also trade-offs.

5. ACKNOWLEDGEMENTS

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Table 1. Social performance of UK beef system

Impact subcategory	Performance indicator	Score UK beef	Reference scale score
Operational Health and Safety	Number of work accidents	0.3	-2
	Presence of a formal policy concerning health and safety	7 yes	
Safe and Healthy Living Conditions	Complaints with regards to safe and healthy living conditions	Yes	-1
	Presence of flood defence measures	Average	
	Presence of emission minimization measures	Maintain good litter quality (dry and friable) by circulation air and standard climate control	
Local employment	Percentage of workers belonging to local communities	80-100%	2
	Presence of a policy with regards to local hiring preferences	Yes	
Fair competition	Presence of an anti-competitive behaviour policy	Yes	2
	Presence of a fair price and fair trade policy for small scale entrepreneurs	Yes	

UK

UK

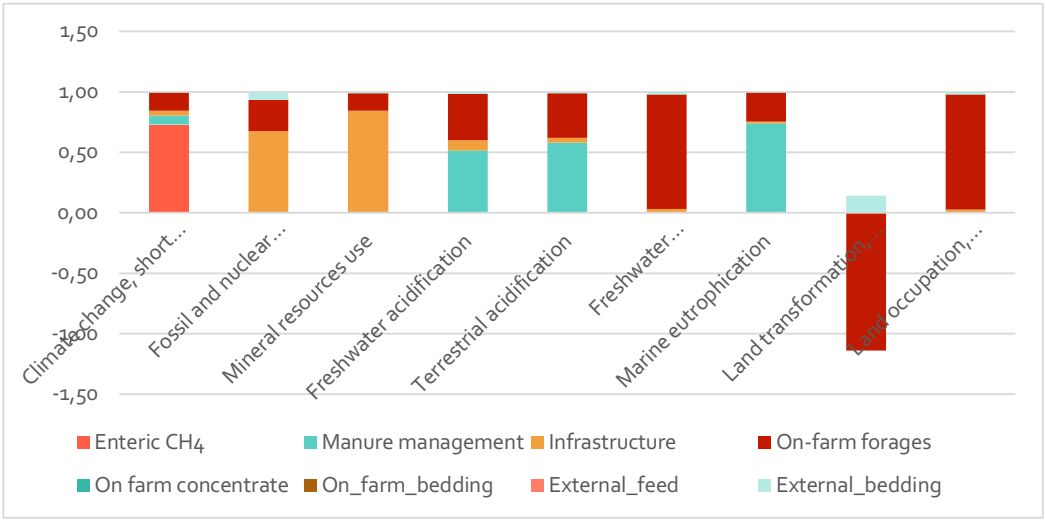

Figure 1. Contribution analysis for impact categories of beef system

Table 2: Economic performance of beef and FADN average (farm type specialist cattle)

Impact category	Profitability		Value creation			Amount jobs		Quality jobs	Competi-tiveness	Markup
Indicator	FNI[a]	FNI / FWU[b]	FNVA[c]	FNVA / FWU	FNW[d]	AWU[e]	FWU	Depreciation/AWU	Receipts / costs	Markup
	k€ / year	k€ / year / FWU	k€ / year	k€ / year / FWU	k€ / year	AWU	FWU	k€ / AWU	-	%
Farms	165	132[f]	251	201[f]	2,925	3.41	1.20[f]	7	1.63	-6.1%
FADN	6	5	13	11	1,275	1.37	1.16	14	1.04	-17.9%

[a] FNI = Farm Net Income; [b] FWU = Family Working Unit; c FNVA = Farm Net Value Added; [d] FNW = Farm Net Worth; [e] AWU = Annual Working Unit; [f] Excluding two farms that had a low amount of own labour (40 and 80 hours per year). Including these two farms, the means would be: FWU = 1.08, Farm Net Income/FWU = €2,212,689 / year, Farm net value added/FWU = €2,861,886 / year.