# Behind the Scores: Evaluating Sustainability Constructs and Farm Structural Factors in European Livestock Systems

Jorge Campos González[a], Seval Cicek[c], Pietro Goglio[d], John Helming[c], Anna Hessle[e], Marc Muller[c], Simon Moakes[b], Annabel Oosterwijk[c], Simon Pelaracci[d], Nina Roehrig[a], Coen van Wagenberg[c], Laurence Smith[a,e]

[a] University of Reading, UK, [b] Aberystwyth University, UK, [c] Wageningen University, The Netherlands, [d] University of Perugia, Italy, [e] Swedish University of Agricultural Sciences, Sweden

## Abstract

Sustainability assessments rely on composite scores to evaluate farm performance across environmental, economic, and social dimensions, but their reliability is often overlooked. This study examines the Public Goods Tool (PGT) results across 106 European livestock farms, assessing its reliability and the role of key structural farm variables in driving sustainability. Given Europe's diverse livestock systems, ensuring indicator robustness is essential for effective policy evaluations.

Using Cronbach's alpha (α), we analyse the internal consistency of the sustainability constructs. Results reveal high reliability for constructs like Profitability (α = 0.94) and NPK Budget (α = 0.87), while others, such as Animal Welfare (α = 0.33), Energy & Carbon (α = 0.44), and Landscape & Heritage (α = 0.42), lack consistency, indicating a need for refinement. Logistic regression shows that structural farm variables significantly impact sustainability performance. For instance, growing more crops enhances system security, while higher livestock densities negatively affect environmental dimensions.

Our findings highlight the importance of reliability testing in sustainability assessments and the impact of structural farm characteristics on evaluation frameworks. Refining low reliability constructs and integrating key farm variables could enhance the PGT's applicability for sustainable livestock farming in Europe.

"This research has been developed within the PATHWAYS project, funded by the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 101000395."