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Integral valuation of ecosystem services and environmental benefits in livestock farming

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Abstract

Socio-ecological systems are based on the perspective of humans in nature. Natural systems produce ecosystem services for human beings, while social systems intervene in natural systems with positive (environmental benefits) and negative externalities. Livestock production takes place in a natural ecosystem, with human intervention. Accordingly, in livestock farming there exist both ecosystem services and environmental benefits. Our objective is to identify the main ecosystem services and environmental benefits present in livestock farming and propose an integral valuation strategy. We conducted an extensive literature review, established a working group with experts from the field, and conducted applications of proposed methods in the field. Based on this, we identified and prioritised seven ecosystem services and three environmental benefits for valuation, namely, food service, feed service, carbon storage and sequestration, microclimatic regulation, soil fertility, habitat for species, aesthetic appreciation, methane emissions reduction, water footprint reduction, and land use reduction. Our integral valuation strategy consists of the implementation of three valuation methods, i.e., ecological valuation, economic valuation, and social valuation. Our main result is the design of ten integral valuation strategies ready to be piloted in the field. These strategies will be fundamental for the economic and environmental assessment of different interventions in livestock farming and will complement traditional cost-benefit and financial viability analyses. We have currently implemented these strategies in three studies in Colombia to evaluate the reduction of methane emissions in silvopastoral systems with improved pastures and the reduction of the carbon footprint in meat and milk production. Our findings show favourable outcomes when the environmental values are captured. The integral value of ecosystem services and environmental benefits will provide crucial support for informed decision-making on specific restoration initiatives, considering the project's objectives and the potential return on investment.

Keywords: Ecosystem services, integral valuation, livestock farming, socioecological systems