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Effect of slaughter age on environmental efficiency on beef cattle in marginal area including soil carbon sequestration: a case of study in Italian Alpine area

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A study conducted in the South Tyrolean region examined 20 beef farms, categorized based on the age at which cattle were slaughtered: 10 farms with a slaughter age of 12 months (SA12) and 10 farms with a slaughter age of 24 months (SA24). The assessment utilized a life cycle approach, employing two functional units (FU): 1 kg of live weight (LW) and 1 kg of carcass weight (CW). Key environmental indicators, including global warming potential (GWP100, kg CO2-eq), acidification potential (AP, g SO2-eq), and eutrophication potential (EP, g PO4-eq), were investigated. Additionally, the study incorporated the carbon sequestered by pastures and permanent grassland to estimate the overall carbon footprint. Results revealed that the SA12 system exhibited significantly lower GWP100 values for both functional units, with reductions of 8.5% and 7.4% in terms of LW and CW, respectively, compared to the SA24 system. Specifically, the SA12 system demonstrated an environmental impact in terms of GWP100 at 19.5 ± 1.1 kg CO2-eq/kg LW, which was significantly lower than the SA24 system at 22.9 ± 1.1 kg CO2-eq/kg LW. When factoring in carbon sequestration, the observed values for GWP100 remained significantly lower for SA12 compared to SA24, emphasizing the favourable environmental profile of beef production in the Alpine region of South Tyrol, particularly within extensive parameters and carbon sequestration considerations.

Exploring the role of traditional management practices to cope with climate change in mountain areas

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Livestock grazing systems constitute a traditional activity in mountain areas. They are adapted to vegetation growth cycles in meadows, forests and grasslands, and deliver ecosystem services such as open landscapes, wildfires prevention, biodiversity maintenance and quality products. Climate change poses a new challenge on mountain grazing systems by impacting on its natural resource base. We provide a detailed analysis of the potential impact of climate change on livestock grazing systems in the Spanish Pyrenees using the NODRIZA model to evaluate different scenarios (optimistic, medium, and worst) and adaptation strategies. Under the optimistic scenario, natural pasture quality and productivity enhancement improves cow body condition score, feed self-sufficiency, and gross margin by increasing the length of the grazing season. The medium climate change scenario initially improves farming indicators but returns to current levels in the long term, with adaptation actions resulting in a worsening of farm feed self-sufficiency and gross margin due to the shortened length of the grazing season. The worst climate change scenario severely impacts the functioning of farms from the beginning, and traditional adaptation actions help maintain herds' nutritional state but at lower farm feed self-sufficiency and gross margin. Therefore, alternative adaptation strategies are needed for grazing farming systems in the region to face declining pasture quality and productivity under climate change.