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**Socioeconomic and environmental sustainability of mountain farming**

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Mountain livestock farms are coupled human-nature systems that provide many ecosystem services benefiting the wellbeing of society. We analyze the dynamics of mountain livestock systems in the Spanish Pyrenees in the last three decades through socioeconomic and environmental perspectives. From the socioeconomic perspective, we identified a general trend of evolution driven by the reforms of the Common Agricultural Policy. This trend implied farming structural changes (product orientation, agricultural area, labor reduction) together with an increasing dependence on public economic support to remain profitable. Additionally, we found different trajectories of evolution related to contrasting regional and household contexts. Farms from each valley studied adapted to regional limiting factors (agricultural area, tourism development and labor opportunities), and farms managed by elder farmers, with low formal education and dynamism presented lower adaptive capacity. From the environmental perspective, these changes implied sustainability improvements at the local scale (higher grazing period, lower dependence on purchased feeds), but lower overall sustainability given their reduced autonomy (high economic dependency and purchase of goods and services). Environmental accountability allows to consider all the work and resources that have been necessary to produce the goods and maintain the services that are lately purchased by farms, thus allocating to farms the environmental load associated with them. We argue that the often-alleged higher efficiency of industrial farming systems enhanced by dense feeds and high dependence on purchased inputs does not hold at the global scale given the embedded resources necessary to produce them, making mountain grazing systems a favorable alternative to reduce the dependence of livestock systems on fossil fuels.

## Session 7

## Theatre 2

**Mountain sheep farming: a provider of environmental services**

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In France, 85% of sheep farms are located in mountain areas. In these areas, livestock farming is usually the only possible economic activity and the only way to preserve grasslands. Sheep farming provides a wide range of services, particularly environmental ones: maintaining biodiversity, sequestering carbon, preserving water quality for the most important. One of the objectives of the LIFE GREEN SHEEP project is to study these services. Furthermore, it aims at reducing the carbon footprint of sheep meat and sheep milk by 12% while ensuring farms' sustainability in 5 EU countries (France, Ireland, Italy, Spain, Romania). Data from 421 French sheep farms (257 meat and 164 dairy) representing various rearing systems located in mountain areas, the project provides a good overview of the contribution to maintain biodiversity, store carbon in soils and limit impacts on water quality of these systems. Preliminary results indicate a contribution to maintaining (ordinary) biodiversity of 2,1 and 1,4 eqha/ha for meat and dairy systems respectively. Moreover, mountain meat sheep farming helps to store 456 kg C/ha and 343 kg C/ha for dairy farms. It also limits nitrogen leaching, 12 and 32 kg N/ha for meat and dairy farms respectively, thanks to the use of grasslands and low use of inputs and mineral fertilizers. Compared with lowland systems, mountain systems contribute more to maintain biodiversity, store more carbon and leach less nitrogen. Finally, mountain sheep systems also help to regulate the climate by offsetting an average of 22% and 65% of GHG emissions for dairy and meat systems respectively.