ods of sheep production in North America are extremely diverse and very climate dependent with dry-land grazing in the south-west of the USA, and temperate climate grazing without or without use of mixed crop grazing, in the middle, eastern and northern regions of Canada and the USA. But cold winters, severe predator issues, high value of land, and marketing opportunities have led to the industry adopting intensive housing production techniques including lambing out-of-seasons, which may be viewed by the public as less sustainable. However, sheep production contributes importantly to diversity of agriculture here as well as addressing specific cultural demands from new immigrants.

The Investing in Sustainable Livestock Production Guide (Investing in Sustainable Livestock (ISL) Guide, 2020) provides a framework for the sheep industry to develop strategies to better achieve sustainability. Using its "Principles for the Environment", issues that should be or are being addressed include: "Contribute to a Sustainable Future", e.g., the role of lamb, sheep milk products, and wool as a source of locally produced high quality protein and fibre; "Enhance Carbon Stocks", e.g., moving more arable and marginal lands into improved pasture including silvopastoral systems; "Improved Efficiency at Animal and Herd Levels", e.g., weaning more lambs per ewe and per year; "4. Source Feed Sustainably", e.g., while here it is necessary to feed stored feeds for part of the year, augment diets with crop residues and industry by-products; "Couple Livestock to Land", e.g., manage manure and deadstock by properly composting and returning to the land to contribute to soil nutrient balances but not contaminate surface and ground water; "Minimize Fossil Fuel Use" e.g., use natural ventilation systems for housed sheep, generate renewal energy on the farm (wind turbines, solar panels on buildings), reduce use of synthetic fertilizers; "Foster an Enabling Environment", e.g., improve decision making by applying expert knowledge at a local political, institutional and economic context, when making evidence and consensus-based decisions as an industry.

The guide also provides "Principles for Animal Health". Those unique include prevent and control animal diseases; ensure the welfare of animals; healthy animals for safer food; reduce risk of zoonoses; and prudent and responsible use of antimicrobials. By applying these guiding principles, veterinarians and their clients can significantly contribute to sustainability of the sheep industry in the USA and Canada.

Reference

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Challenges for sustainable production around the world: Europe

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Sustainability of sheep production in Europe has been a topic of debate in the last years. Previous studies pointed out the main factors that can enhance or limit the sustainable development of the sheep sector according to the different pillars of sustainability and viewpoints of stakeholders. Strengths and opportunities normally relate to the favourable conditions for pasture-based production due to abundant grazing resources, the existence of local breeds adapted to the exploitation of such resources, the high quality of the products, the comparatively lower dependence on external inputs, and their capacity to produce public goods. However, stakeholders also point at many weaknesses and threats such as land use conflicts, difficult working conditions, low labour availability, lack of succession, high dependency of subsidies, low productivity, decreasing consumption of sheep meat, among others.

The number of sheep and specially holdings has decreased across Europe. Authors point at the Common Agricultural Policy as one of the main drivers of this process due to multiple flaws in policy design and targets. In parallel to the abandonment of sheep farming in most Mediterranean and mountain areas, there has been a process of intensification in more favourable areas, with increasing levels of external inputs, lower use of grazing resources and higher productivity levels, which not always rendered higher economic profitability. Few studies assess the negative correlation between intensity and technical efficiency with long term sustainability, explained to a large extent by the use of local renewable natural resources.

What are the prospects for sheep production in Europe? These is no easy answer, but we can point out some key issues that might influence its future evolution. First, sheep farming is multifunctional and contributes to the delivery of important ecosystem services, but public policies need concrete environmental targets (and indicators) and adequately pay for the provision of public goods. Second, sheep systems need to differentiate the products based on their extrinsic quality (characteristics of the production system) and convince consumers of the differential quality attributes of pasture meat vs. industrial meat. Third, succession and the opportunity costs of labour will continue to determine the evolution of sheep farming. Public policies favouring new entries and improving living conditions in rural areas might improve the chances of continuity. Finally, the capacity to deal with unexpected and abrupt changes related to global change (notably climate variability and hazards, and uncertain markets for inputs and outputs) will define the future of agriculture. Sheep systems might be more resilient to climatic disruptions and have comparative advantages due to their higher adaptive capacity to harsh conditions, their temporal and spatial mobility, and the lower dependence of external inputs, but we need to know better the determinants of resilience, both in farms and farmers.

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