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# Livestock grazing systems and sustainable development in the Mediterranean and Tropical areas

## Recent knowledge on their strenghts and weaknesses

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## Conclusion and perspectives

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The notion of efficiency and the applications of this concept in the scientific sphere have evolved over time in line with the current societal issues. Originating with productivism, within which it constitutes a technical-economic indicator among others to evaluate performance, efficiency took on a new meaning when tools were sought to economise resources, in particular energy resources: initially for their cost, and later for their scarcity, and more recently for their impact on global warming and the environment. Far from being a 'catch-all' concept, efficiency, as a tool for analysis and reflection, can therefore be adapted to a variety of contexts and contribute to addressing numerous issues, as illustrated by the preceding examples.

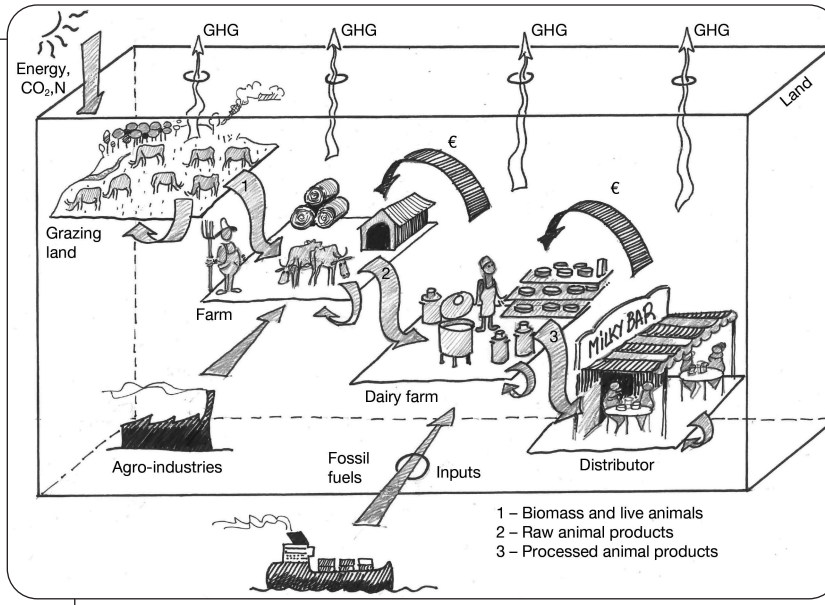
This capacity of the notion of efficiency to produce quantitative indicators relevant to the issues of each era is invaluable today in livestock farming. In the face of the numerous criticisms and opportunities in the world of modern animal husbandry, what does efficiency have to offer us?

### In terms of method

The absence or scarcity of established scientific references, which would allow an evaluation of the efficiency of tropical livestock systems for grazing, is very clear from the various examples. As a result, the insights and analyses are based on partial assessments, supplemented by a transfer to the South of data and concepts developed on farms and territories in the North. The limits of this approach are clear, in view of the differences at all levels: the operating methods of grass-fed livestock systems are very different in the tropics. The methodological challenge is therefore crucial in producing the scientific references that are missing.

This chapter describes a wide range of methods used to analyse efficiencies in various tropical livestock areas. It clearly illustrates the adaptability of the concept of efficiency, which is essential for analysing a sector as diverse as livestock production. The authors have given us an overview of the diversity of applications for this concept, in highly contrasting contexts. A wide range of criteria can be integrated into the calculation of livestock efficiency, whether in terms of resources mobilised, energy, nutrients, land, labour, etc., or in terms of services or dis-services generated: food, protein, GHG emissions, employment, added value, etc. These are all possible views, each of which can make sense in terms of the specificity of one issue or another. There is also diversity in the spatial dimension or scale of analysis: efficiency can be measured from forage plots to territories or livestock sectors and even beyond. Finally, there is a diversity of dimensions, as efficiency applies as much to the technical or biological and environmental fields as to the social and economic fields (Figure 3.19). All these levers offer possibilities for fine-tuning the choice of criteria, according to the problem at hand.

**Figure 3.19. From the plot to the territory, the overlapping of multi-criteria and multi-level efficiencies calculated from different types of flows: materials, greenhouse gases (GHG) and money (€). Illustration: É. Vall.**




The analysis of efficiencies can relate to various types of flows: material, income, energy or greenhouse gas emissions. It can also focus on specific compartments, such as the grazed plot with its herd, the farm, the sector or the territory. Each of these approaches reflects complementary aspects and perspectives, which enriches the assessment and allows for relevant comparisons between farms, regions or livestock systems, including at the global scale.

Another virtue of the concept of efficiency is to represent complexity as effectively as possible on the basis of a simple criterion. The various methodological boxes in this chapter highlight the complexity of the calculation methods behind the simple and synthetic efficiency indicators. In addition to these indicators, the extent to which efficiency makes it possible to develop systemic reasoning beyond the single criterion being assessed, is demonstrated. Based on an equation and its analytical reasoning, the authors mobilise, and accordingly question, all the factors and mechanisms which, by interacting, govern the targeted criterion in each case study. This systemic view is particularly fruitful when it comes to shedding light on the functioning of activities as complex as livestock farming, notably livestock grazing. In this way, nitrogen efficiency does not simply involve a digestibility or metabolism equation, but requires consideration of the multiple biomasses involved, classifying the transformation processes to which they are subjected throughout the biomass recycling loop. Ultimately, this leads to consideration of integration of agricultural and livestock activities, the flow between

grazed, cultivated or fertilised areas and the labour force involved. The depth of the long term can also be considered if necessary, as in the Brazilian Amazon: an analysis of the efficiency of landscapes in this livestock-raising region means reconstructing how, over time, the occupation of space was based first on criteria of land appropriation, then on environmental regulations and today on the agronomic aptitude of the soil for fodder production. It is this accumulation of traditions that forms the landscape in which farmers and their animals evolve, and which efficiency analysis helps to decode.

There is no doubt that these two methodological characteristics, based on plasticity and systemics, make efficiency a valuable concept for analysing contemporary livestock farming and thereby understanding the possible forms of livestock farming of the future. This is especially true since it is possible to combine several criteria, or levels, in integrative assessments. Multicriteria and multilevel analyses are suitable for understanding a third fundamental characteristic of grass-farming: its multifunctionality. This is abundantly illustrated here, from India to the Amazon, via the Nile delta, the plateaus of Madagascar, the Cévennes hills and transhumance in the Provence. In no place is grass-farming limited to the production of meat, milk, or even leather or fibre. According to the environments and societies in which they are embedded, these livestock systems fulfil other functions, such as land control, asset accumulation, savings, social status or prestige, and the production of multiple ecosystem services or dis-services. The examples in the sub-chapter The pursuit of efficiency to support the agroecological transition in livestock systems reveals how multi-criteria analysis is essential to account for this multifunctionality and how efficiency can reflect several of these criteria. Our work on multifunctionality also highlights the limits of efficiency analysis, even when it is multi-criteria, which does not always produce the relevant indicators, for example in the social dimension. This is one of our fields of research, to improve the consistency of the methods for calculating these multiple indicators.

## In terms of communication

Livestock farming is at the core of numerous controversies, where information is often partial and influenced by a biased message and where scientific impartiality is sorely lacking. It is regularly criticised, notably in the wake of health or environmental emergencies. In addition, new controversies are emerging and public opinion is raising questions about the nutritional risks associated with meat consumption, the production of artificial meat and the rights and well-being of farm animals. Positive views are also expressed on grass-fed farming, praising the interest of shorter circuits, the contribution of farmers to the maintenance of landscapes, the quality of taste or the cultural values attached to livestock products and territories. In this often passionate, even conflictual context, lobbies are formed and appeals are drafted. Communication becomes an issue, a terrain where stakeholders clash, and where simplification is a strategy or even a weapon, leading to the risk of misinformation.

Efficiency also has advantages in this area of communication: it simplifies without being overly simplistic, which makes it valuable for enriching societal debates on livestock production. Comparing resources to outcomes, or undesirable products to intended products, are simple enough intellectual exercises to be well understood or applied, and meaningful enough to make people think beyond preconceived notions or activist slogans. This chapter provides numerous illustrations which, if transposed into public debate, could improve the formation of opinions, precisely because they are based on these principles of simplicity, integration of complexity, relevance to the diversity of issues and objectivity of understanding. In this way, the efficiencies approach can be a genuine gateway for communication between science and society.

## In the field of consultancy and policy guidance

Livestock farming faces numerous transitions around the world. This is why farmers and institutions require objective criteria to make their decisions. Given the complexity of the processes, efficiency measures can be used to weigh up the criteria and identify the most acceptable compromises, especially in terms of livestock practices, but also in terms of sector-based or territorial policies. Studies on the agroecological transition are highly illustrative on this subject. Although they were conducted in different contexts, they all show how measuring efficiency enables researchers to make relevant diagnoses and identify which practices or measures make sense, or would make sense, in terms of local conditions.

However, these studies also indicate that these perspectives are rarely, if ever, mobilised beyond the circle of researchers and academics. Sectoral policies do not promote efficiency in the Senegalese dairy sector or in the internationalised meat sectors of Southern Africa. Crop-livestock integration in Gujarat, India, is limited by farmers easy access to nitrogen fertiliser. In Guadeloupe, intensification and specialisation have been preferred to crop-livestock integration, which is currently holding back the agroecological transition. In other words, although the interest in efficiency approaches is obvious, their appropriation by political stakeholders is limited. The challenge is to go beyond the stage of academic studies so that these indicators are integrated into the standards used by development stakeholders.

Sustainable finance, or green finance, could play the role of catalyst for transitions. It calls for standardised efficiency measures in standard protocols and the establishment of this approach based on carbon footprints and ecosystem services. But these guidelines are still at the trial stage. Similarly, in the public sector, the transfer of competences to municipalities is a major trend in public administrations around the world, directly impacting livestock catchments. They offer the possibility for local institutions to choose their efficiency criteria to build innovative regulations at their level, such as territorial certification. In addition, value chain stakeholders are also attentive to and potentially interested in the mobilisation of these indicators with a view to moving

agricultural sectors towards more socio- and eco-responsible forms of production, in line with product certification procedures.

Finally, democratisation of the use of efficiency measures seems to be a priority in order to better communicate on the diversity of livestock systems and their contribution to sustainable development objectives, as well as to better advise livestock owners and decision makers. While the evaluation methods are rich and well adapted by the scientific sphere, it is the sphere of development and decision-makers that must now be targeted.