



International 58th Meat Industry Conference “Meat Safety and Quality: Where it goes?”

Environmental impact of meat industry – current status and future perspectives

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Abstract

This paper gives an overview of the environmental impact of the meat chain. This industry has a significant impact on the environment and current scientific research outlines three main perspectives – product-based using life cycle assessment as a tool; process-based exploring the main environmental aspects and; systems-based, analyzing the rationale for environmental management. Environmental impacts influence three dimensions – climate change, consumption of natural resources and environmental pollution. Future research should focus on environmental impacts of the meat chain expressed in terms of existing and newly developed environmental indicators and identifying solutions for decreasing the overall environmental impact.

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1. Introduction

The livestock sector's need for natural resources, such as land, water and energy, is increasing and this sector has a severe environmental impact on air, water and soil¹. These impacts arise from various emissions into the environment as well as from the consumption of resources associated with production processes². Meat is one of the food products with the greatest environmental impact due to the inefficiency of animals in converting feed to meat. It is assumed that 75-90% of the energy consumed by livestock is needed for body maintenance or lost in manure and by-products such as skin and bones³. Depending on the perspective of research, environmental performance

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may be analyzed in terms of the meat product, the manufacturing processes and the system in which the meat companies operate, Fig. 1.

The product-based perspective is mainly performed by calculating various environmental indicators and presenting them in relation to the product, expressed as a functional unit. Depending on the role of the company in the meat chain (farming house, slaughter house and meat processing plant), the most commonly used functional units are one kg of livestock^{4,5}; one kg of carcass^{6,7} and one kg of meat⁸.

The process-based perspective is related to analyzing specific environmental aspects connected with the core and supporting processes in the meat chain. Major environmental aspects are discharge of waste water and solid waste and consumption of water and energy^{9,10}. According to European and UN documents, the main environmental performance indicators in meat production are meat yield (share of lean meat in live animal and/or in carcass), solid output (in farming, this is mostly manure; in slaughtering/deboning, this is the percentage of by-product such as offal, bones, fat and skin), energy consumption (electric and thermal) and energy-to-meat ratio, water consumption, waste water discharge and waste water load (mostly chemical oxygen demand) and chemical usage^{9,11}.

The system-based perspective analyzes existing environmental management systems (EMS) in meat companies. EMS research dimensions are drivers and motivation in implementing EMS; costs and financial issues in implementing EMS and benefits and effects of implemented / certified EMS¹². Depending on the time dimension, research covers: *ex ante* (prior to implementation of the EMS), ongoing/mid-term (during implementation) and *ex post* (upon implementation).

The main objective of this paper is to present the main research streams for analyzing environmental performance in the meat industry.

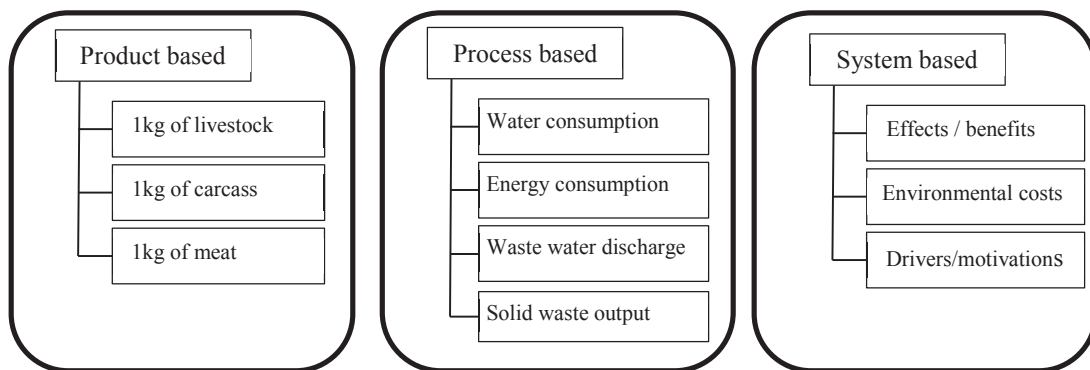


Fig. 1. Environmental research perspectives in the meat chain.

2. Meat product-based perspective

Life cycle assessment (LCA) is an environmental tool that considers greenhouse gasses (GHG) emitted from all stages of agricultural and food production. This methodology is based on ISO 14040:2006 standard and consists of four steps: (i) mapping the process, (ii) setting scope and boundaries, (iii) collecting inventory data, and (iv) interpreting the results¹³. Mapping the process together with setting the scope and boundaries is to clarify which part of the meat chain is analyzed from the “farm to the fork” perspective. It usually covers farms, slaughter houses and meat processing plants, but it may be expanded to cover retail and household use of meat products. Collecting inventory data is the most important part, since the uncertainty of these data may cause imprecise calculation of various environmental indicators. Interpretation of the results is in direct correlation with the boundaries as well as quality of the data collected. Finally, as a result of the LCA study, mitigation strategies can focus on the primary sources of environmental impact within the meat chain, interpreted in relation to the functional unit.

In respect to more than fifteen different environmental indicators developed in the LCA, the main meat chain impacts are global warming potential, acidification, eutrophication and use of resources¹⁴. It has been confirmed that

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