Nose to tail – how to allocate the environmental burden of livestock production systems to different meat cuts?

Stucki Matthias and Eymann Lea
Zurich University of Applied Sciences
Institute of Natural Resource Science
Grüental, 8820 Wädenswil
Switzerland
matthias.stucki@zhaw.ch

Zurich University of Applied Sciences
Life Sciences and Facility Management
Institute of Natural Resource Sciences

Hirsiger Eva
Eaternity, 8057 Zurich
Switzerland
ehirsiger@eaternity.ch

Introduction and Objectives

- **"Nose-to-tail eating**" is a global trend that refers to using every part of an animal instead of valuing only premium cuts such as filet and steak (e.g.[1]).
- It is a matter of **allocation**, to show how environmentally favourable the use inferior meat cuts is. In LCA studies of agri-food systems economic allocation is frequently used to handle multi-output processes [2]. However, most studies analysing the environmental impact of meat are limited to the differentiation between meat and slaughter by-products [3-6].
- **This study aims at assessing the environmental impact of individual meat cuts.**

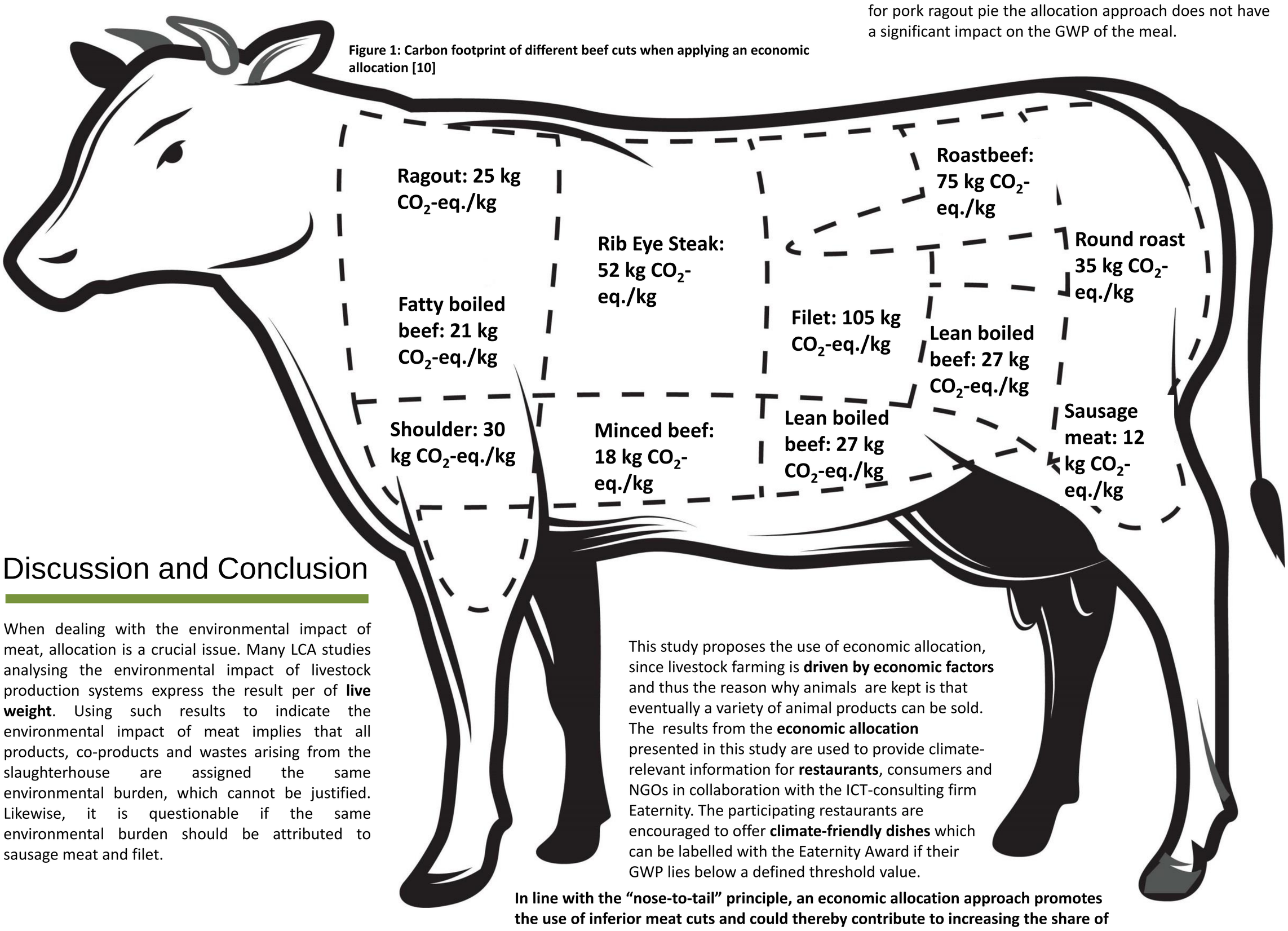
Method

- In a first step, the **global warming potential (GWP)** of beef, calf and pork under **live weight** was calculated applying the **IPCC 100a** impact assessment method in the SimaPro 8 software to the Agribalyse v1.2 database [7].
- In a second step, the environmental burden of meat and slaughterhouse by-products was determined based on **economic allocation using Swiss meat prices** [8].
- Subsequently, the environmental impact of meat cuts was calculated using two different allocation approaches (mass and economic allocation).
- Finally, the allocation factors were applied to GWP of beef, calf and pork.
- Furthermore, the impact of meat dishes on climate change was computed using the global warming potential of additional ingredients from the database set up by Eaternity [9].

Results

For expensive meat cuts like filet, the economic allocation approach results in up to 3.3 times higher environmental impacts than mass allocation. Applying mass allocation, the GWP of beef, veal and pork is 31.8 kg CO_2-eq/kg, 16.1 kg CO_2-eq/kg and 3.6 kg CO_2-eq/kg, respectively. With economic allocation the greenhouse gas emissions of different **beef** cuts range from **12 kg CO_2-eq/kg** for **sausage meat** to **105 kg CO_2-eq/kg for filet** (Figure 1). For **veal and pork** the GWP of meat cuts ranges from **6.0 kg CO_2-eq/kg (sausage meat) to 38 kg CO_2-eq/kg (filet)** and from **0.4 kg CO_2-eq/kg (pork rind) to 10.9 kg CO_2-eq/kg** (filet), respectively, if economic allocation is applied. When assessing the environmental impact of meat dishes the choice of the allocation approach has a major influence on the result. For Beef Wellington, for example, the GWP per serving is 6.0 kg CO_2-eq if mass allocation is used to compute the filet's climate impact, and 18.3 kg CO_2-eq when economic allocation is applied. In contrast, for pork ragout pie the allocation approach does not have a significant impact on the GWP of the meal.

Figure 1: Carbon footprint of different beef cuts when applying an economic allocation [10]



Discussion and Conclusion

When dealing with the environmental impact of meat, allocation is a crucial issue. Many LCA studies analysing the environmental impact of livestock production systems express the result per of **live weight**. Using such results to indicate the environmental impact of meat implies that all products, co-products and wastes arising from the slaughterhouse are assigned the same environmental burden, which cannot be justified. Likewise, it is questionable if the same environmental burden should be attributed to sausage meat and filet.

This study proposes the use of economic allocation, since livestock farming is **driven by economic factors** and thus the reason why animals are kept is that eventually a variety of animal products can be sold. The results from the **economic allocation** presented in this study are used to provide climate-relevant information for **restaurants**, consumers and NGOs in collaboration with the ICT-consulting firm Eaternity. The participating restaurants are encouraged to offer **climate-friendly dishes** which can be labelled with the Eaternity Award if their GWP lies below a defined threshold value.

In line with the "nose-to-tail" principle, an economic allocation approach promotes the use of inferior meat cuts and could thereby contribute to increasing the share of an animal's body used for human nutrition.

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