

Allocation procedures in the beef life cycle assessment

Claudio Mazzini* | Nicola Brina | Sara Daga | — Coop Italia
Fabrizio Boeri | Massimo Marino | Sonia Pignatelli* | — Life Cycle Engineering

*Corresponding author. e-mail: pignatelli@studiolce.it - claudio.mazzini@coopitalia.coop.it

Summary

The beef production is one of the food sectors with the highest environmental impact: this is mainly due to the feed production, the manure management and the methane emissions from enteric digestion processes.

Even if the high impact is well known among all the LCA practitioners, it is quite important the definition of the hypotheses because some of them are quite relevant for the final result such the functional unit (meat boneless or not), the system boundaries (from where to where), the data quality requirements, etc. Probably, the most important hypothesis needed for the beef LCA is related to the definition of the allocation rules between the many by-products generated along the chain.

Considering the whole chain, for example, aspects that shall be considered are:

- how to consider the impact of reproductive cow used for the generation of calves;
- the allocation rules when the reproductive cow is mainly bred for the milk production; in that case it is necessary to define the portion of impact to be allocated to the veal (by-product of farms that produce milk).
- how to deal when the meat comes directly from milk cow or reproductive cow for calves production at the end of their life;
- how to consider the leather.

Beside that, also the decision about the allocation approach is quite important: economic allocation, mass allocation or other alternative approaches (i.e. biological causality defined as the physiological feed requirements of the animal to produce milk, meat or other by-product) could be used. Aim of this work is to present the approach chosen for the PCR preparation just published by The International EPD system® after a long international public consultation.

PCR and The International EPD® system

As defined in the ISO 14025, a product category rules (PCR) is a set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories. The overall goal of an Environmental Product Declaration, EPD®, is to provide relevant, verified and comparable information about the environmental impact from goods and services.

All suggested PCR documents must be subject to an open consultation procedure before officially being approved.

Further information is available here: <http://www.environdec.com/>

PCR content

The PCR approved by The International EPD system contains the allocation rules organised in the following main steps:

- definition of the kind of meat considered in the LCA;
- identification of the breeding stages included in the System boundaries with particular regards to the life cycle of the reproductive mammals;
- attribution of the economic values to products and by-products generated by the system.

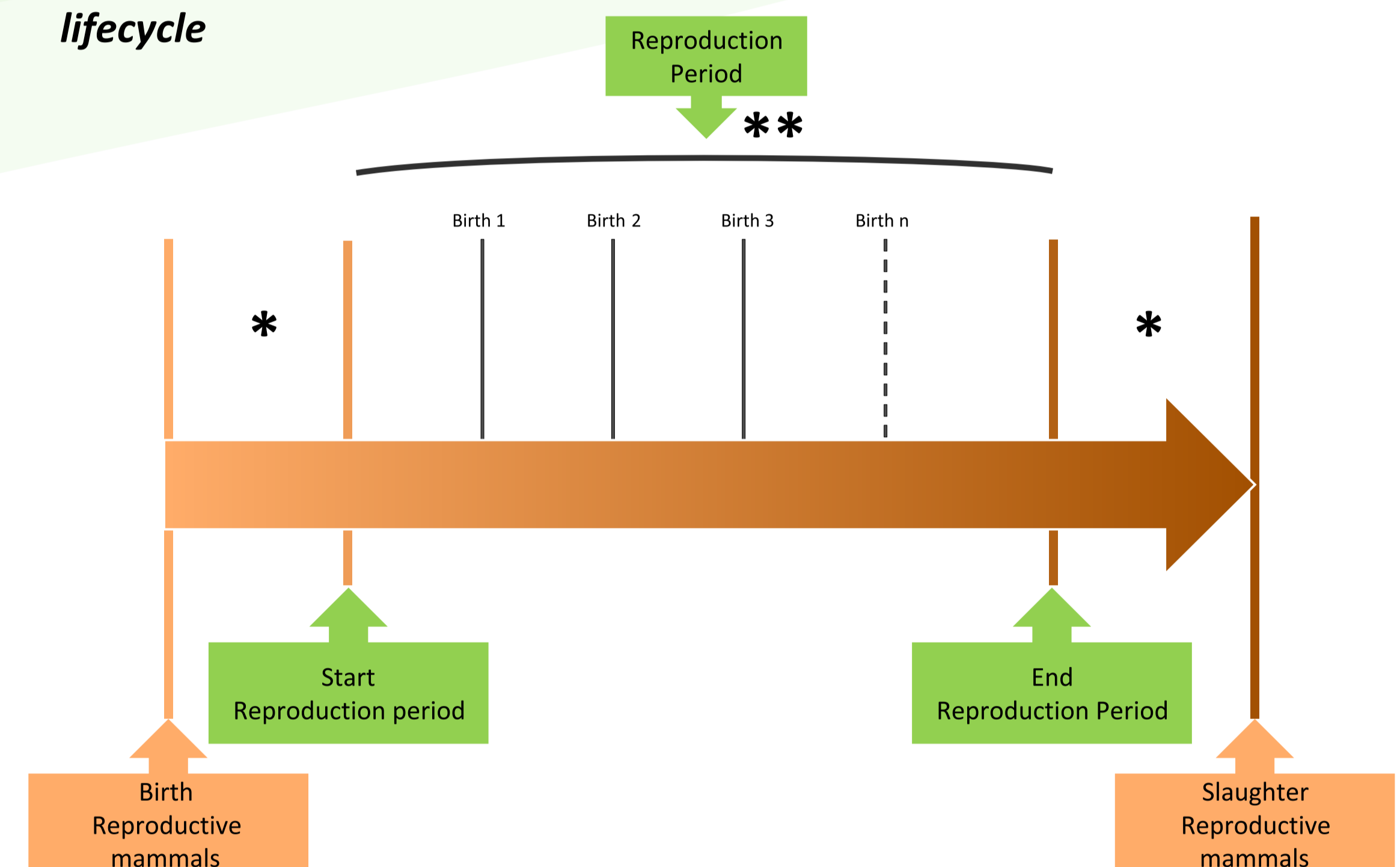
Details

The allocation procedure is detailed in the following table.

The co-products associated to meat production chain may vary in relation to the type of mammal and may generate different form of food products or miscellaneous goods; in all cases, the impact allocation must be done for all sub-products considering an estimate of their economic value

Further information is available on the PCR 2012:11 published on www.environdec.com.

Reproductive mammals lifecycle

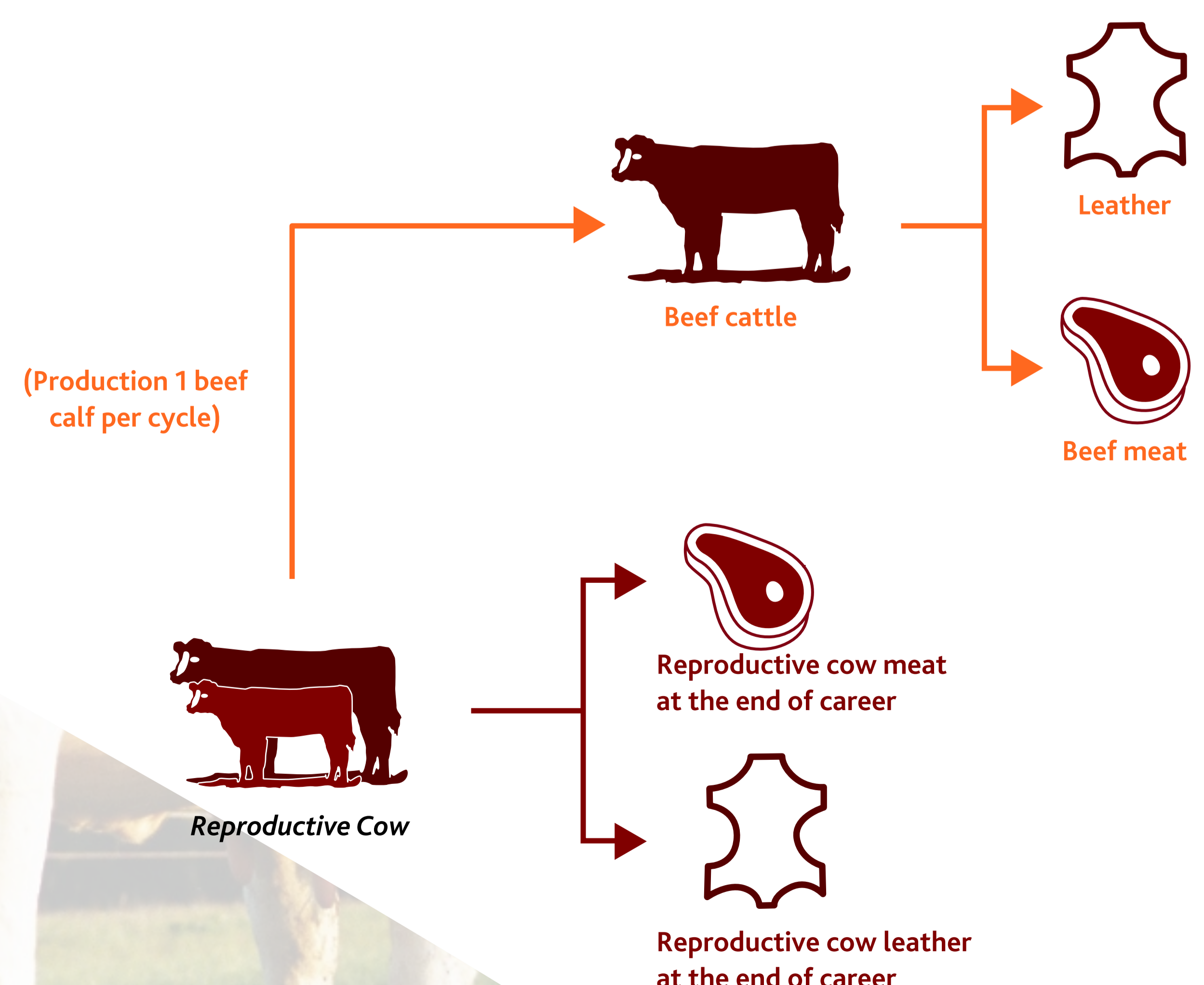
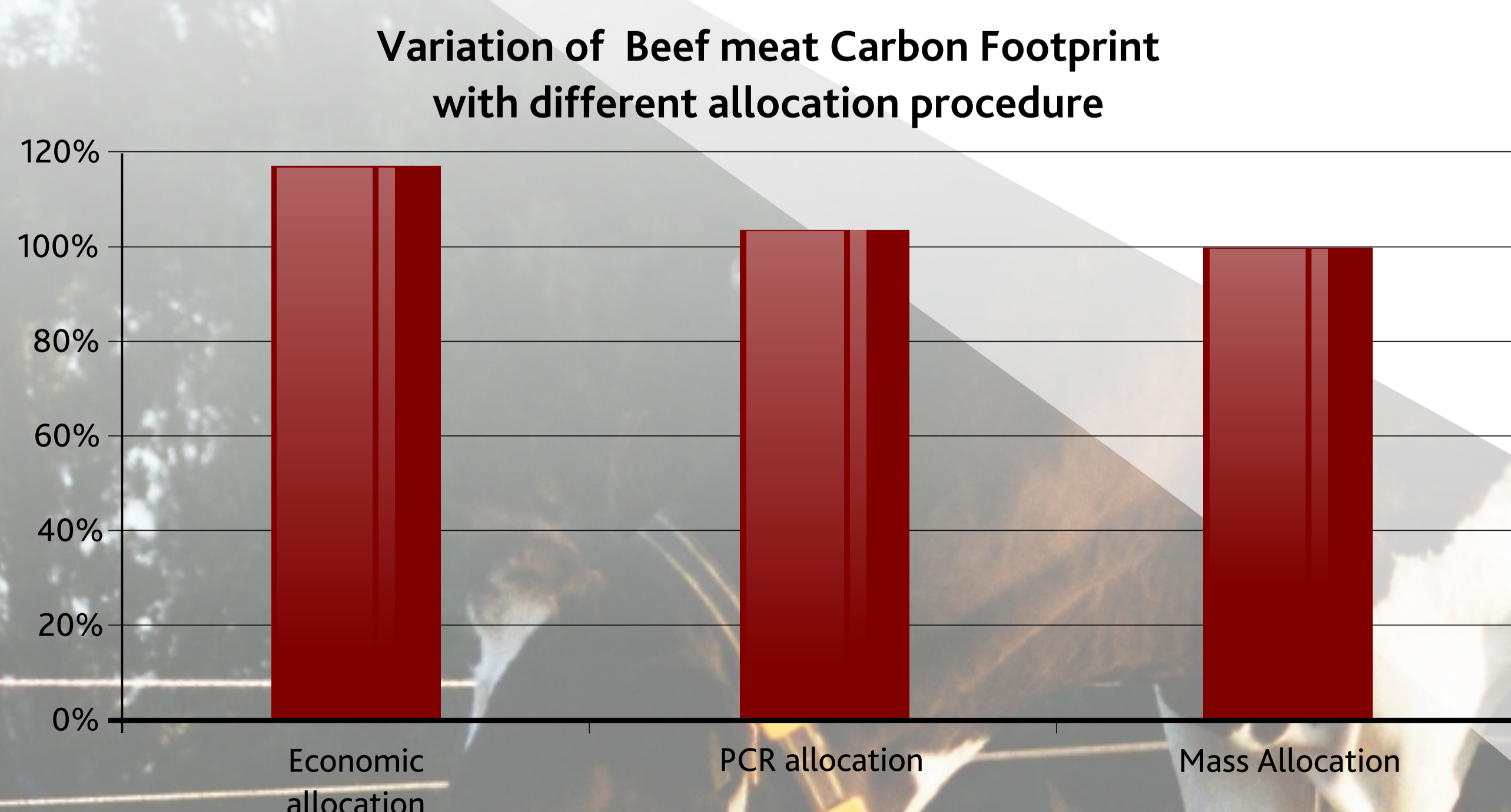


* Phase contemplated only impact calculations of Reproductive Mammal meat
**Phase attributed to meat from mammals produced (contemplating allocating with any co-products)

MEAT SOURCES	BREEDING PURPOSE	Elements included in the System Boundaries for the calculation of the meat
Bovine	Beef meat production	<ul style="list-style-type: none"> • Environmental impact of entire bovine lifecycle; • Impact of Reproductive cow related to lifecycle phases dedicated to the reproduction and nurturing of bovine divided by the number of bovines produced.
Calf	Milk production	<ul style="list-style-type: none"> • Environmental impact of entire calf lifecycle; • Impact of Milk cow related to lifecycle phases dedicated to milk production; the impact is allocated on an economic basis between the milk produced and calves generated.
Reproductive cow at the end of career (Object of the transformation into meat)	Reproduction	<ul style="list-style-type: none"> • Impacts of the Reproductive Cow lifecycle before entering the reproductive phase; • Impacts of the Milk Cow lifecycle starting from the last breeding phase up to its slaughter.
Milk cow at end of career (Object of the transformation into meat)	Milk production and Reproduction	<ul style="list-style-type: none"> • Impacts of the Milk Cow lifecycle before entering the milk production phase; • Impacts of the Milk Cow lifecycle starting from the last breeding phase up to its slaughter.

Example

A sensitivity analysis of different allocation procedure applied to the Meat production from cattle is here shown.



References

Product Category Rules - PCR 2012:11 Meat of mammals fresh or chilled CPC Code 2111-2113 - Version 0 of 11th September 2012.
International Dairy Federation Bulletin, 2010. A common carbon footprint approach for dairy - The IDF guide to standard lifecycle assessment methodology for the dairy sector - report n°45/2010
Cederberg C., Stadig M., 2003. System Expansion and Allocation in Life Cycle Assessment of Milk and Beef Production, International Journal of LCA 8 (6), p.350-356.
Ponsioen T., Kool A., December 2010. Carbon footprint assessment of calf milk replacer, calves and veal, Blonk Milieudvies Study.
Blonk H., Ponsioen T., Kool A., Marinussen M., April 2011. The Agri-Footprint method - Methodological LCA framework, assumptions and applied data - Version 1.0, Blonk Milieudvies Study, Barilla Center for Food and Nutrition (BCFN), 2011. 2011 Double Pyramid: Healthy Food for People, Sustainable for the planet, Supporting technical paper Version 2 of 14 July 2011. Casey J. W., Holden N. M., 2006. Quantification of GHG emissions from suckler-beef production in Ireland, Agricultural Systems 90 (1-3), p. 79-98. Ecoinvent Swiss database, v.2.0, www.ecoinvent.ch.