Brief description of the carbon footprint model for Danish beef production	Ansvarlig	aoma
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Projekt: 8542 - Vejene til en mere klimavenlig dansk kalve- og oksekødsproduktion udgår fra malkekvægholdet	Side	1 af 2

Kortlægning af de forskellige kødproduktioners klimaaftryk (work package 1)

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The model calculates the climate change impacts of beef production in Denmark, and it is able to differentiate across the impacts from dairy cattle, from both conventional and organic production systems, for large breed, jersey, cross-breeds young stocks from large breed, and cross-breeds young stocks from jersey (i.e., 8 production systems), and the impacts from suckler cattle, from both conventional and organic production systems, for both intensive and extensive systems (i.e., 4 production systems). Thus, a total of 12 production systems are modelled, and each of them distinguishes across the following animal groups: cows, heifers under 18 months, heifers over 18 months, bulls under 12 months, bulls over 12 months, steers, heifer calves (0-1 month), and bull calves (0-1 month). The age and the weight of the different animal groups has been defined based on slaughter data from the Danish cattle database.
Each animal group is produced under specific housing and grazing conditions, which have been defined based on numbers from “gødningsregnskabet”, 2020. The model calculates the methane and nitrous oxide emissions related to the excreted manure based on default values from Normtal 2022/23 and “2019 Refinement to the 2006 Guidelines” (IPCC 2019, v.4, Chapter 10), as a function of the housing type and grazing type. Default values in Normtal 2022/23 are corrected, using the official Normtal 2022/23 formulas, to account for variations in the animal weight and age at slaughter compared with the animal groups defined in Normtal 2022/23.
Each animal group is associated with a specific feed ration that differentiates between the feed eaten “during grazing” and the feed eaten “during housing”. This information is based on feed rations optimized in DMS_NorFor. The upstream impacts related to the production of feed are retrieved from available literature and databases, whereas the enteric fermentation emissions are calculated based on the NorFor enteric fermentation model.
The effect of sending manure to the anaerobic digestor (which translate into shorter retention times of the manure in the stable, and a more stable organic fertilizer that emits less methane but more ammonia) is accounted for using the emission factors presented in Mikkelsen et al., 2016. The percentage of dairy cows and heifers' manure sent to anaerobic digestor is based on Arla Foods amba's data (30% for in 2021); because of the lack of data for other animal groups, it is assumed that none of the remaining manure is sent to anaerobic digestor.
The model presents the impacts per each animal group, per kg carcass, and for whole Denmark (based on statistics that define the number of living animals in Denmark in 2021)
As described above, the model is based on specific background data that define the individual production systems: feed rations, age and weights of the animal groups, number of animals, yearly distribution of the animals between grazing and different housing types. The background data has been generated for most of the production systems. The current model template, however, only calculates the impacts of dairy cattle (via tables and figures) with focus on conventional production systems, both on large breed and jersey (i.e. Excel A).
The impacts of organic large breed and jersey, cross-breeds from both organic and conventional systems, and suckler cows from both intensive and extensive systems (i.e. Excel B to E) will be calculated

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by updating the background data describing these animal groups and production systems. Once this is done, the overall mapping of Danish beef production in 2021 will be available.

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