THE CLIMATE IMPACT FROM CULTIVATION OF PIG FEED

27th January 2022

CPH Pig Seminar
Keynote lecture: Climate impact of pig production

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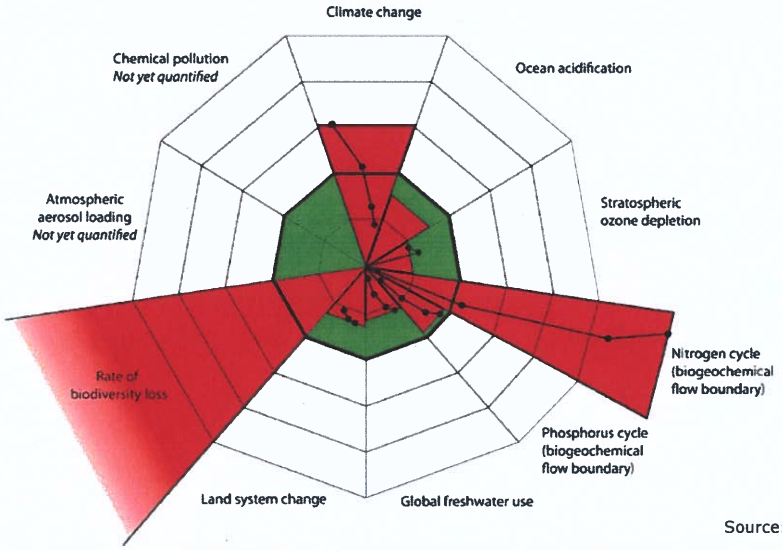
OUTLINE

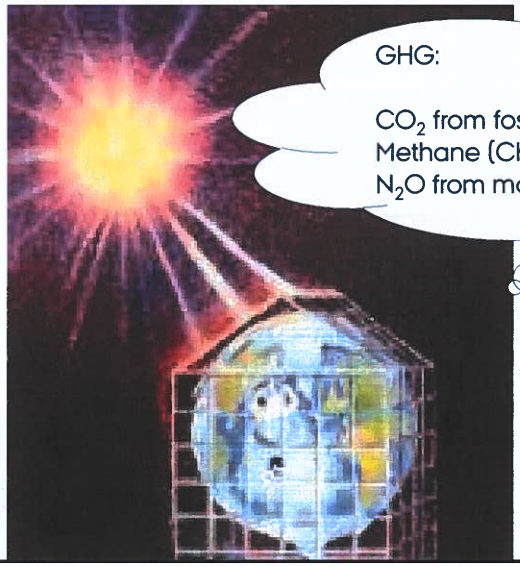
- Background
- Life cycle assesment (LCA)
- Carbon footprint of feed

PLANETARY BOUNDARIES



Source: Rockström et al. (2009)

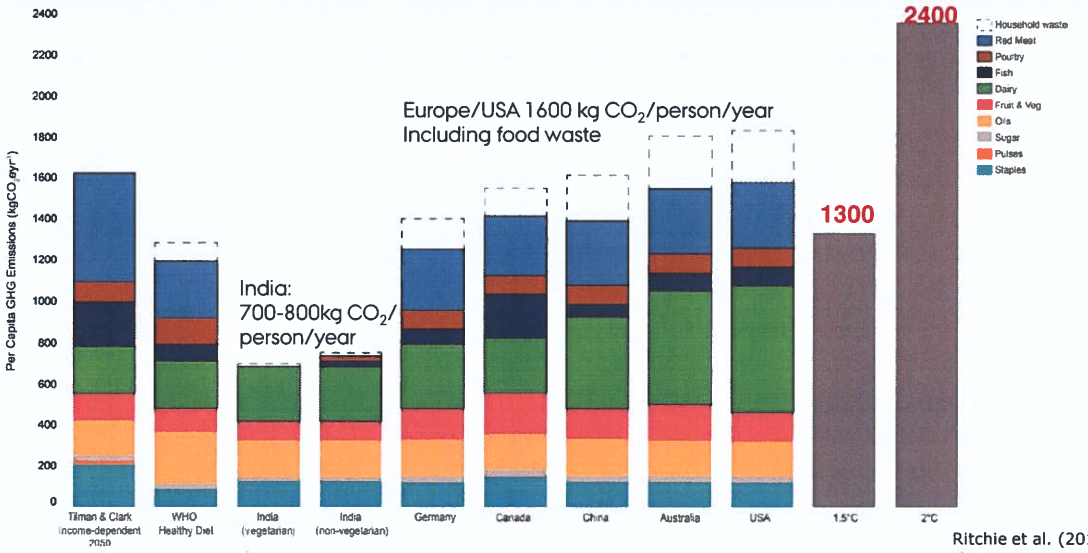
GREENHOUSE GASES (GHG) IN THE ATMOSPHERE



GHG:

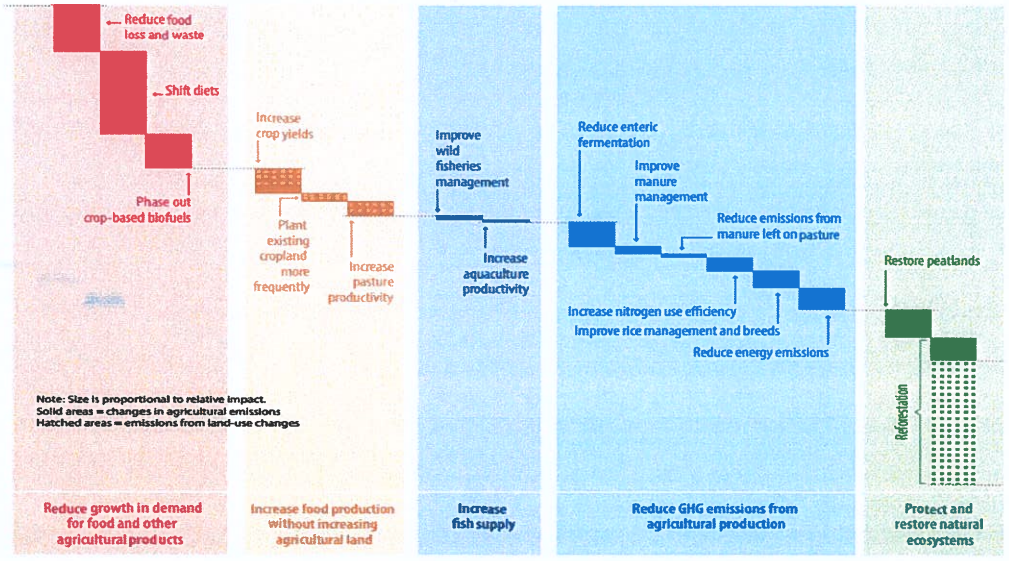
CO_2 from fossil fusels	X 1
Methane (CH_4) from enteric, manure	X 25
N_2O from manure	X 265

THE GLOBAL CHALLENGE



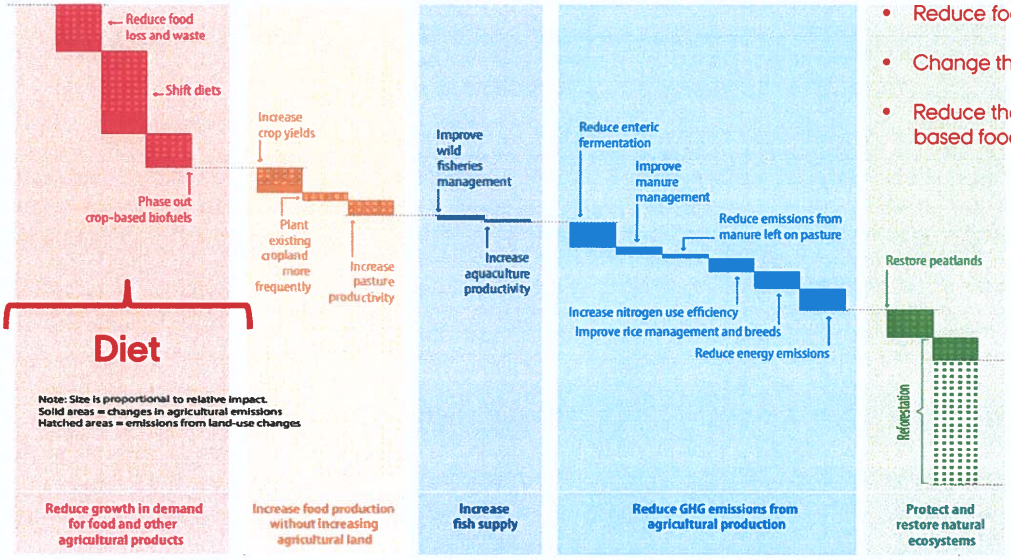
Ritchie et al. (2018)

MITIGATION IN DIET AND AGRICULTURAL PRODUCTION



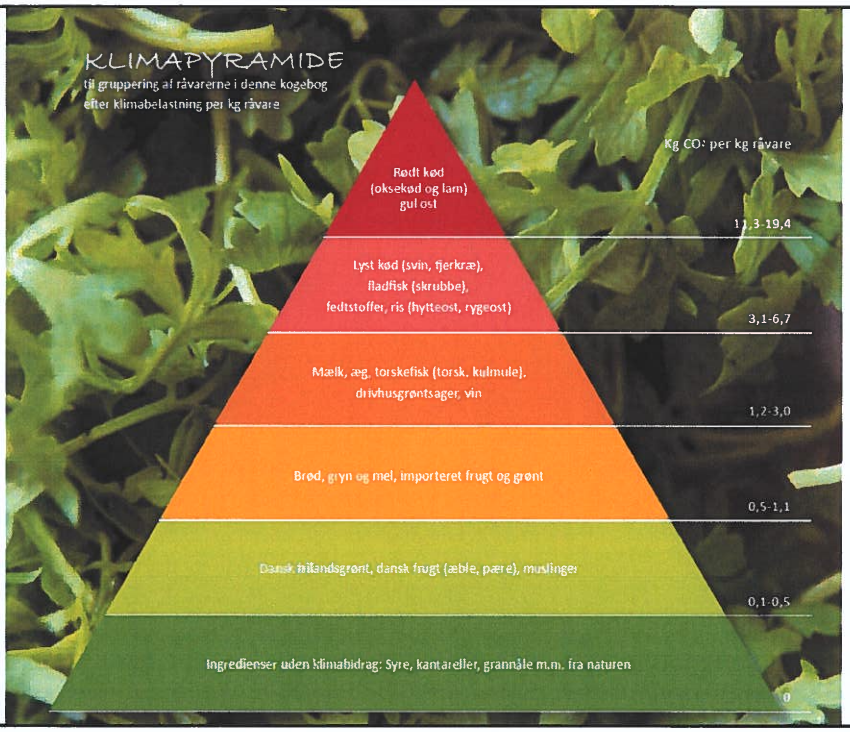
UN (2019)

MITIGATION IN DIET AND AGRICULTURAL PRODUCTION



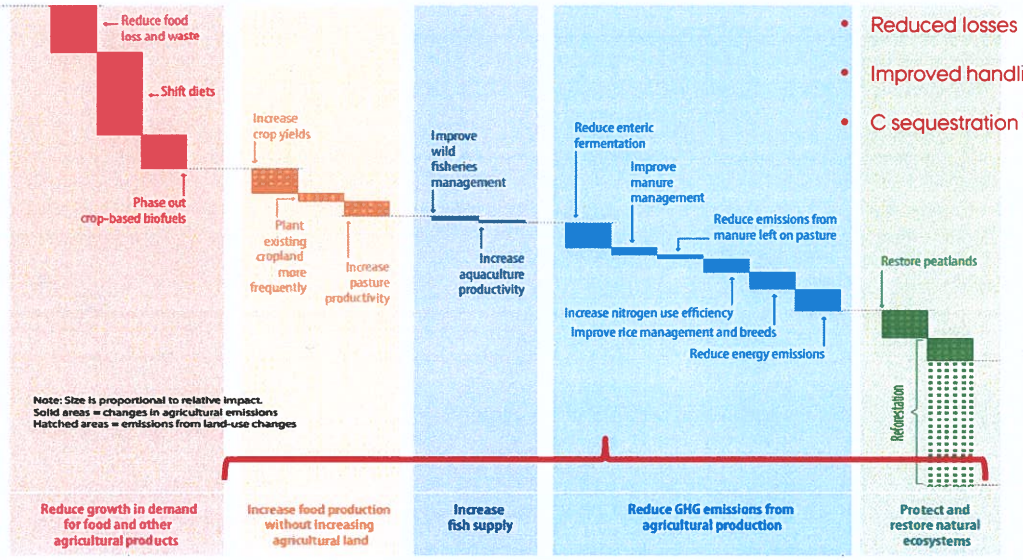
- Reduce food waste
- Change the diet composition:
- Reduce the proportion of animal based food

UN (2019)



MITIGATION IN DIET AND AGRICULTURAL PRODUCTION

- Higher yields by higher efficiency
- Reduced losses
- Improved handling of manure
- C sequestration in soil and trees



UN (2019)

OUTLINE

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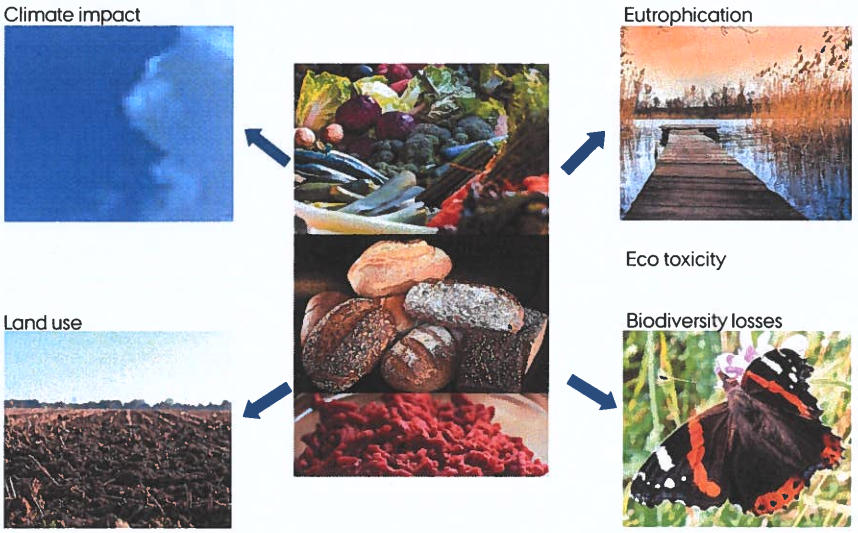
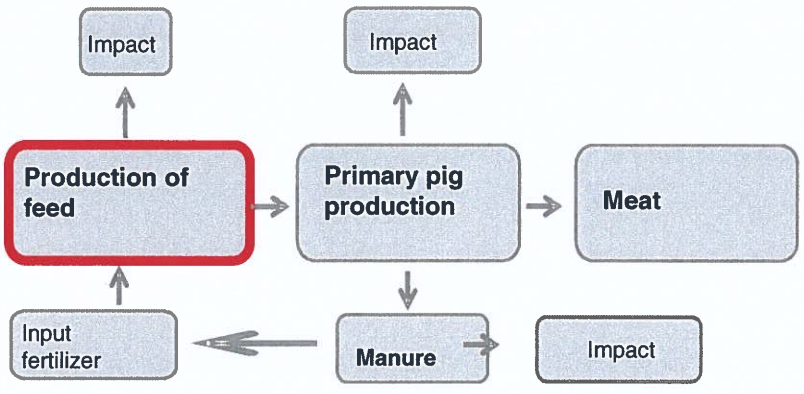
- **Life cycle assesment (LCA)**
- Carbon footprint of feed

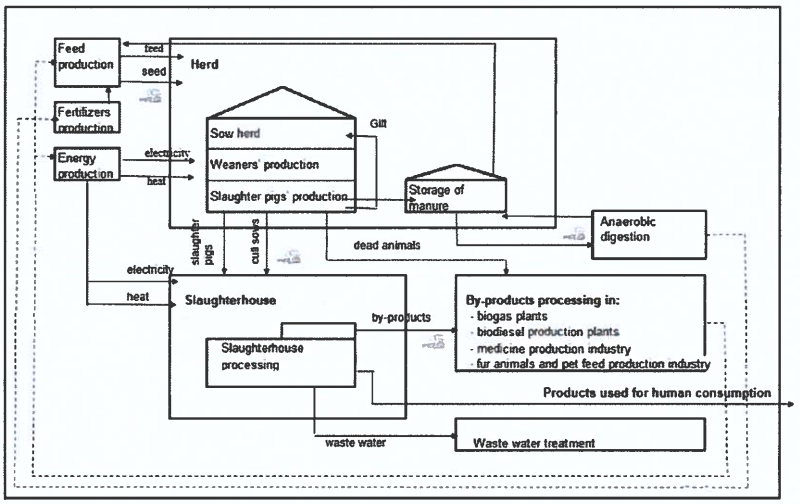
LIFE CYCLE ASSESMENT (LCA)

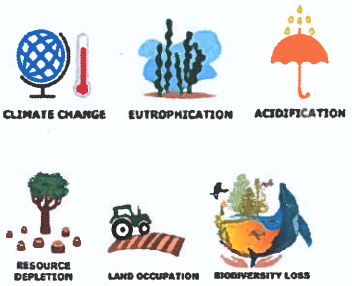


Life cycle assessment (LCA) of a pig system



LCA OF PIG PRODUCTION

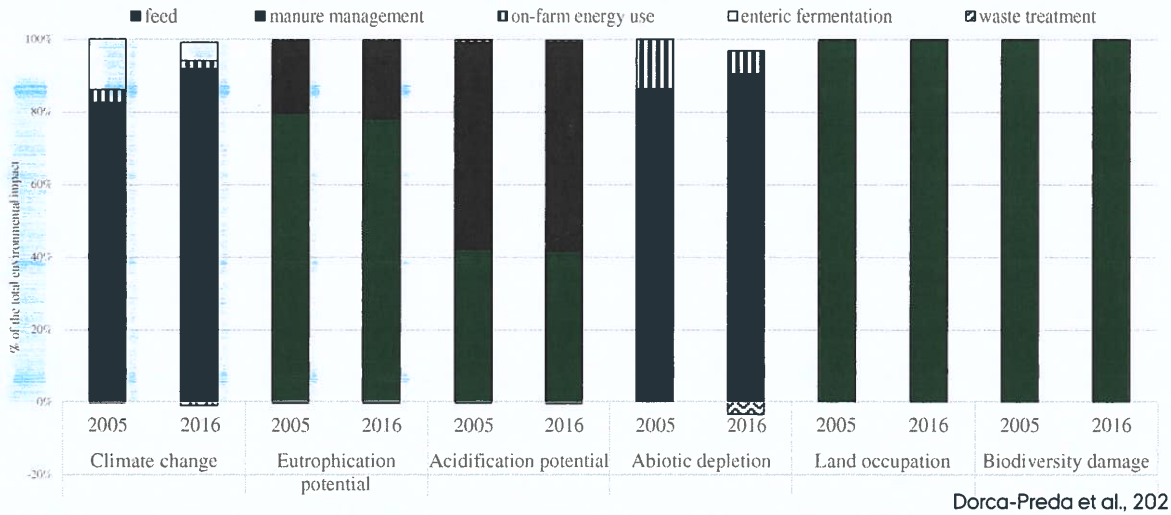




Dorca-Preda et al., 2021

Hotspot in Danish pork production

in 2005 and 2016, % of total impact of primary production



Dorca-Preda et al., 2021

OUTLINE

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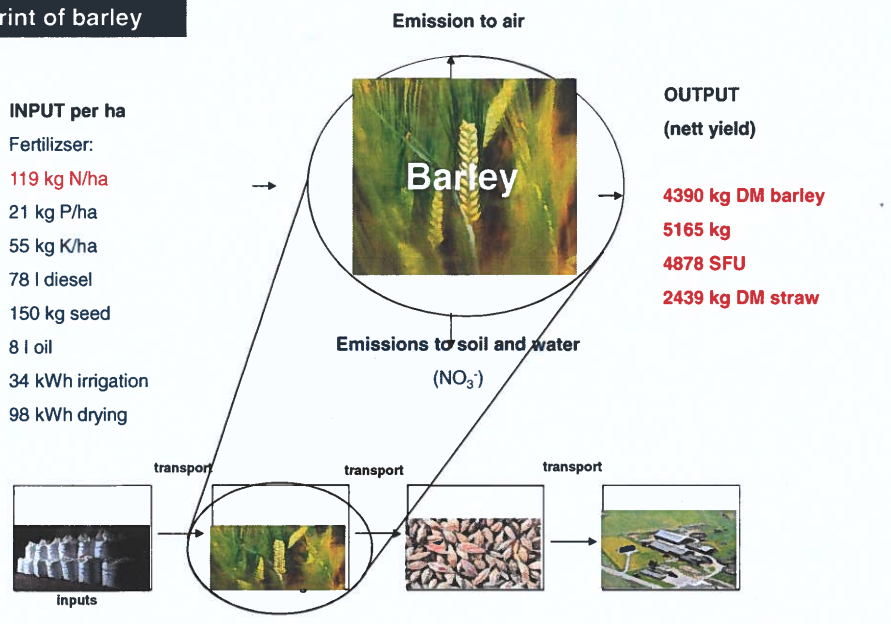
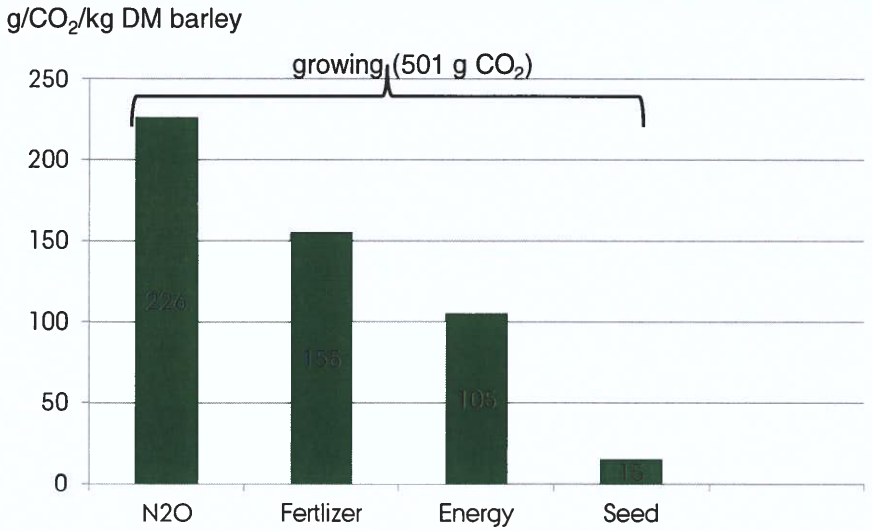
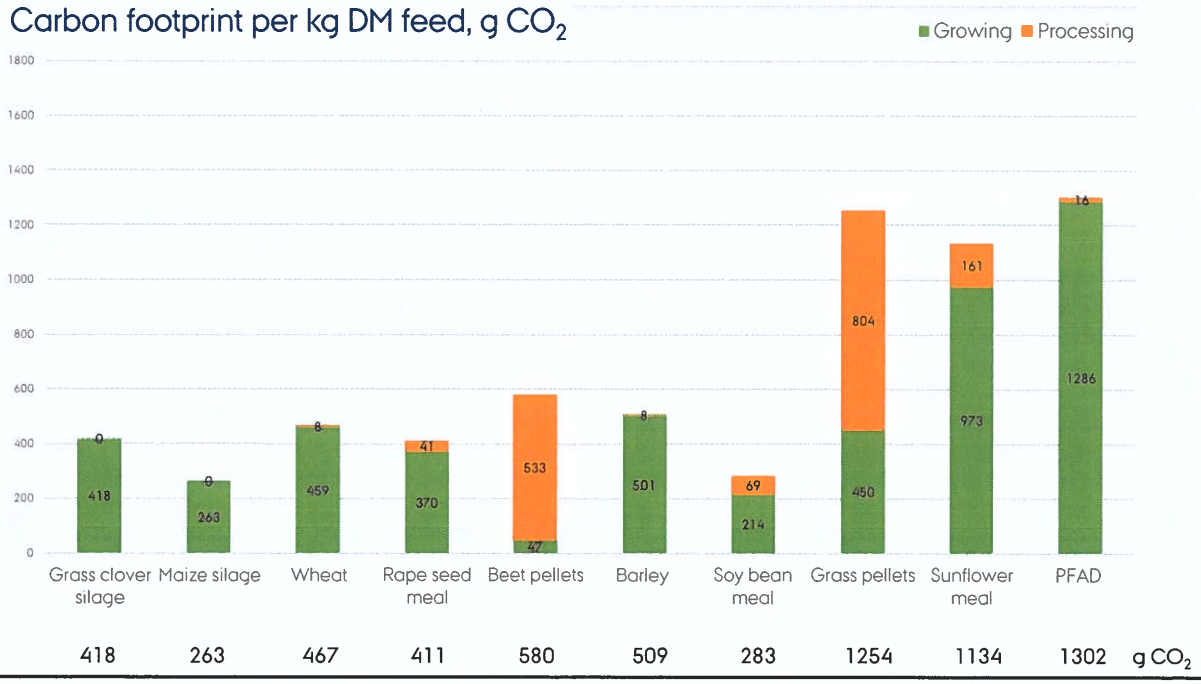
- Life cycle assesment (LCA)
- **Carbon footprint of feed**

Ex carbon footprint of barley



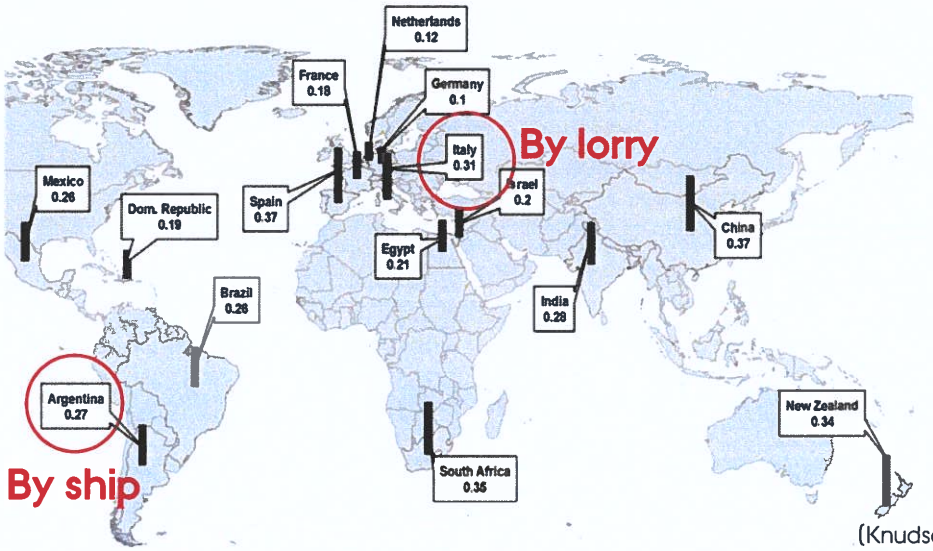
CARBON FOOTPRINT OF BARLEY FROM FARM



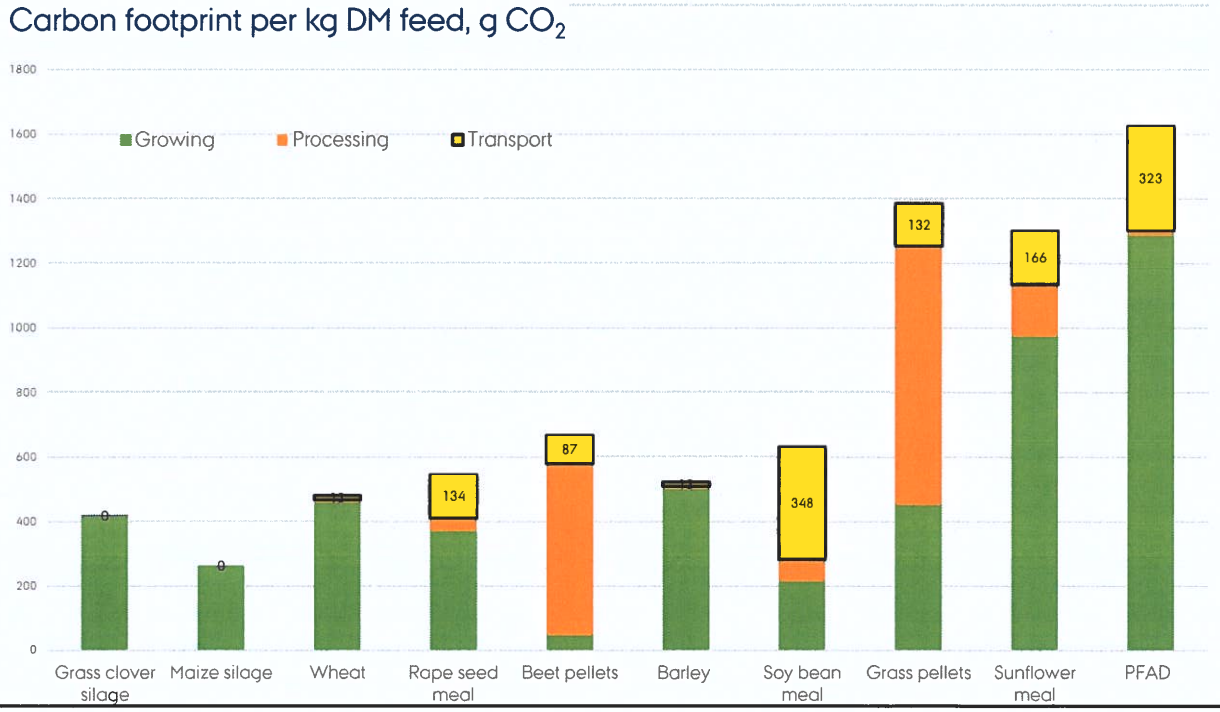


TRANSPORT OF 1 KG PRODUCT,

KG CO_2 /KG PRODUCT



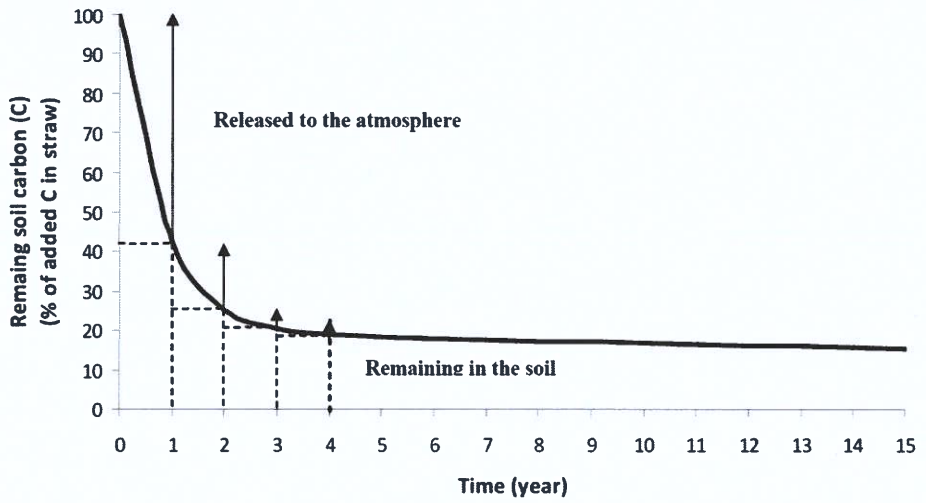
(Knudsen, M.T. 2011)

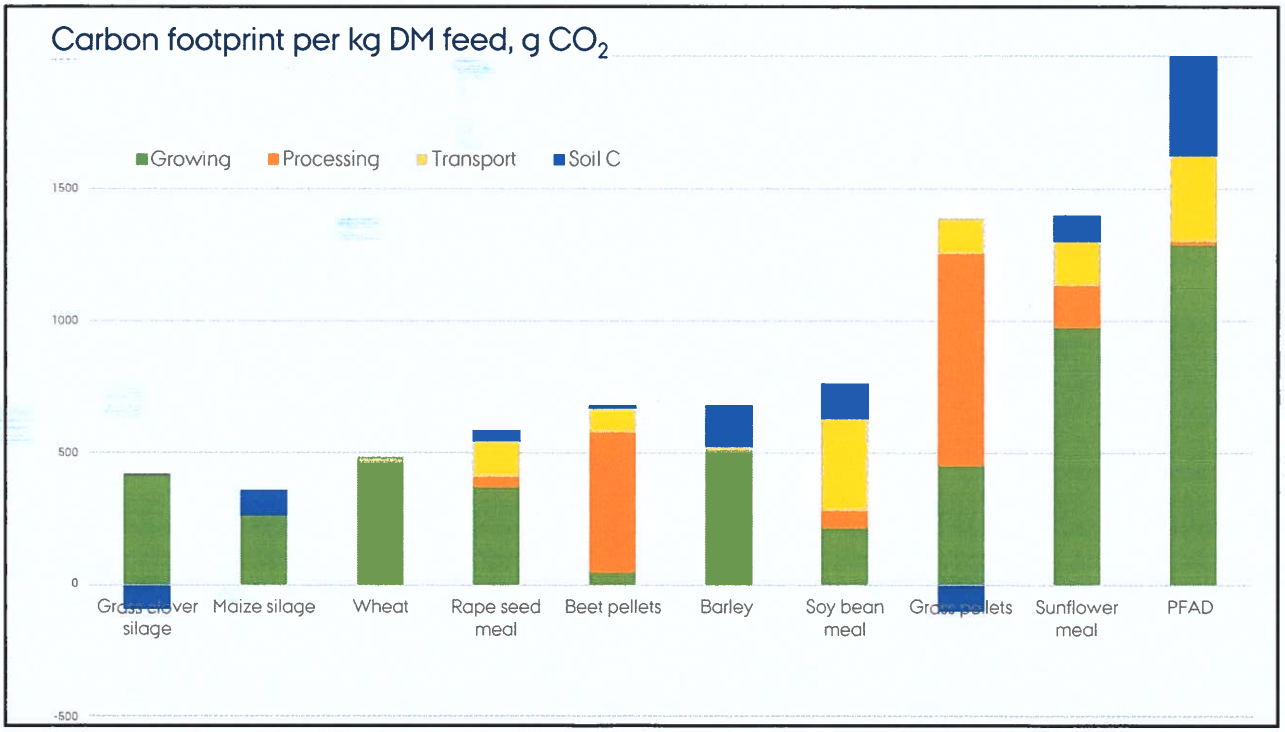


GHG contribution from soil carbon changes

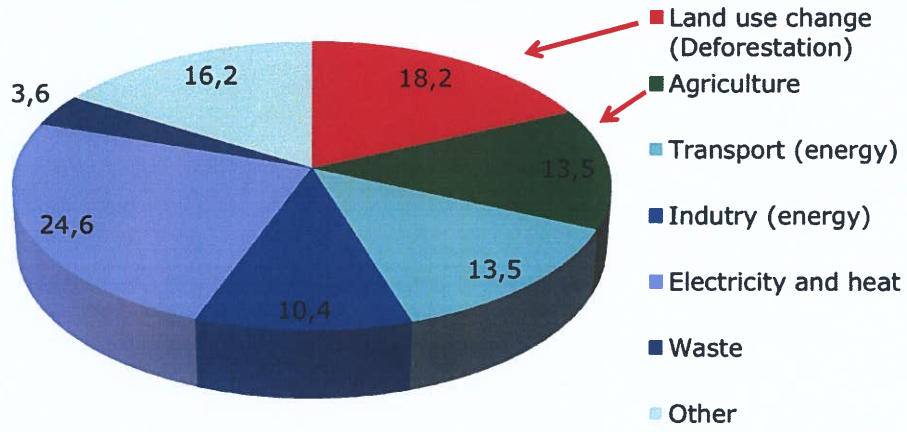
Input of carbon to soil from biomass or manure above and below ground

Decomposition of C from biomass





World GHG emissions
GHG Contribution from Land Use Changes (LUC)

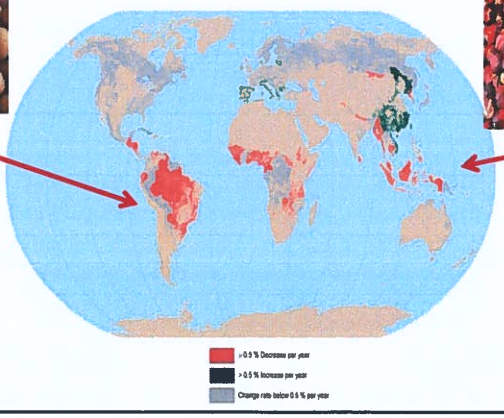


(Baumert et al., 2005. World Resources Institute)

Method I: Direct LUC

Soy bean meal from Argentina and Brazil

Palm oil from Malaysia



Method I: Direct LUC

Soy bean meal	
Direct LUC	g CO_2/kg DM
Argentina	4703
Brazil	3744
Import to DK	4085

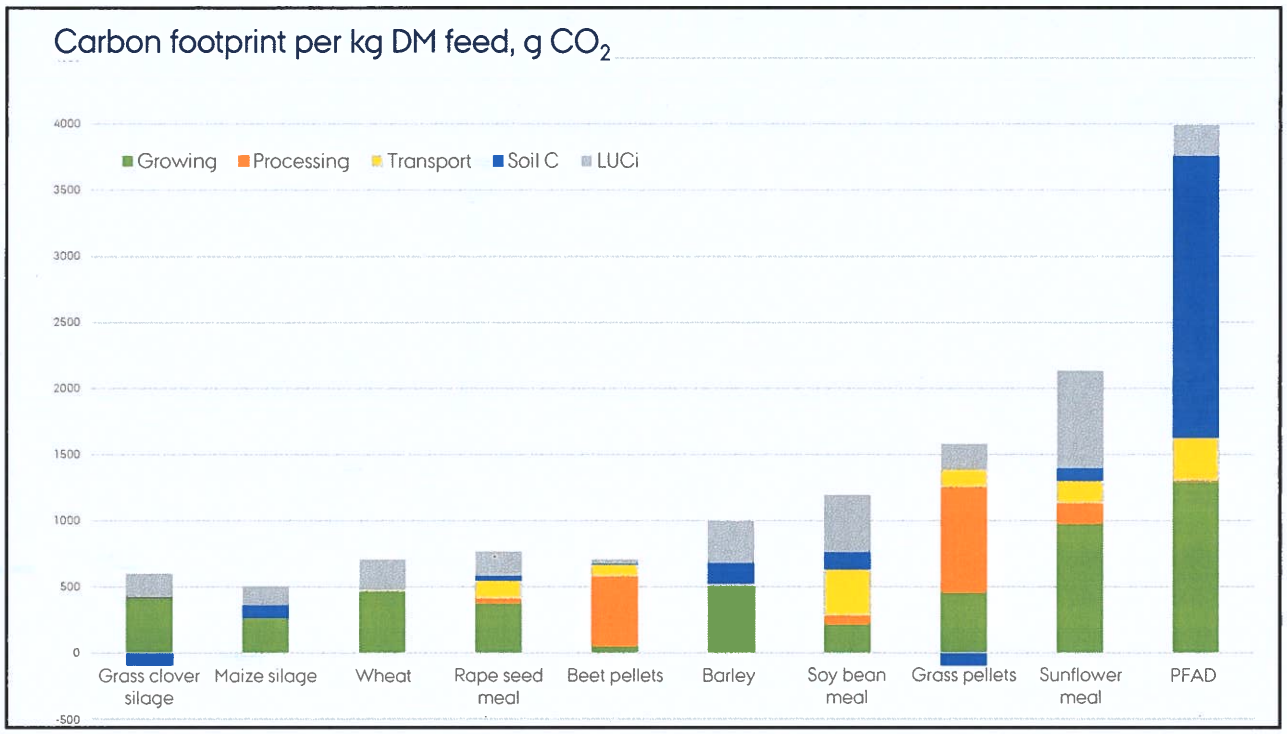
(PAS2050, BSI, 2008)

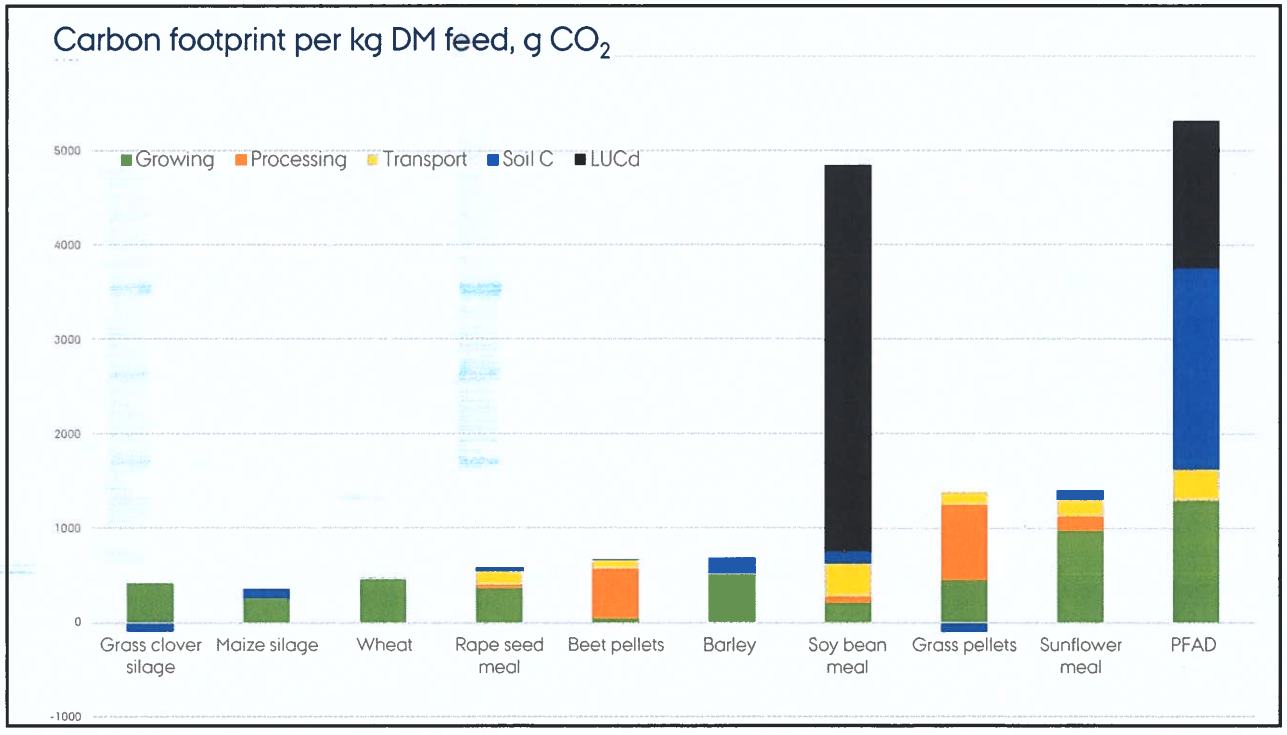
Method II: Indirect LUC

Indirect effect of land use change (LUC) on <u>all</u> feeds:

143 g CO_2/m^2

(Audsley et al., 2009)


Carbon footprint per kg DM feed, g CO_2
Growing
Processing
Transport
Soil C
LUCi
4000
3500
3000
2500
2000
1500
1000
500
0
-500
Grass clover silage
Maize silage
Wheat
Rape seed meal
Beet pellets
Barley
Soy bean meal
Grass pellets
Sunflower meal
PFAD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5000
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Rape seed meal
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Soy bean meal
Grass pellets
Sunflower meal
PFAD

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Environmental impact of Danish pork at slaughterhouse gate – a life cycle assessment following biological and technological changes over a 10-year period

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HIGHLIGHTS

- The environmental impact of Danish pork was analyzed over a 10-year period
- Reductions in the environmental impact were found for all analyzed impact categories
- Biological and technological changes were identified in the pork chain
- Herd productivity increased while feed use per kg live weight gain was reduced
- Slaughterhouse utilization of live pigs increased from 79.4% in 2005 to 83.8% in 2016

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Method for calculating carbon footprint of cattle feeds – including contribution from soil carbon changes and use of cattle manure

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ABSTRACT

Greenhouse gas emissions (GHG) related to feed production is one of the hotspots in livestock production. The aim of this paper was to estimate the carbon footprint of different feedstuffs for dairy cattle using life cycle assessment (LCA). The functional unit was '1 kg dry matter (DM) of feed ready to feed'. Included in the study were fodder crops that are grown in Denmark and typically used on Danish cattle farms. The contributions from the growing, processing and transport of feedstuffs were included, as were the changes in soil carbon (soil C) and from land use change (LUC). For each fodder crop, an individual production scheme was set up as the basis for calculating the carbon footprint (CF). In the calculations, all fodder crops were fertilized by artificial fertilizer based on the assumption that the environmental burden of using manure is related to the livestock production. However, the livestock system is also credited for the fact that the use of manure reduces the amount of artificial fertilizer being used. Consequently, a manure handling system was set up as a subsystem to the cattle system. This method allowed a comparison between different fodder crops on an equal basis. Furthermore, the crop-specific contribution from changes in soil C was estimated based on estimated amounts of C input to the soil.