

Livestock without Shadow

Martin C.Th. Scholten



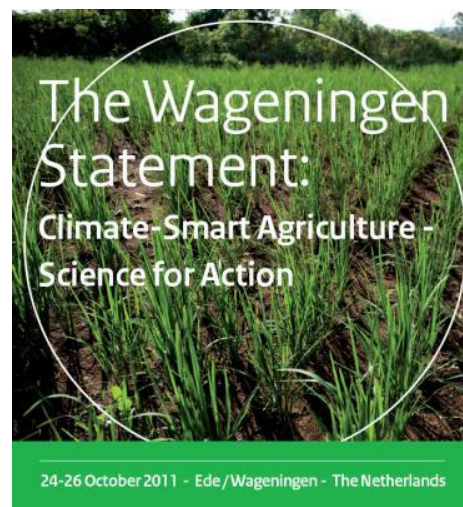
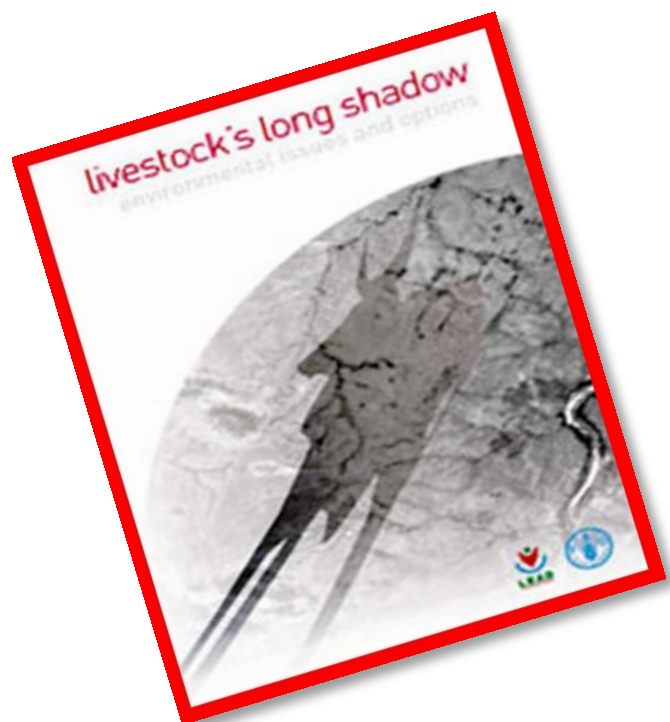
[@mcthscholten](https://twitter.com/mcthscholten)

Animal Task Force

(Wageningen University)



A Big Scientific Challenge: CSA & SAP



A Triple Win in Climate Change

Climate Smart Agriculture

Food Security

Adaptation

Mitigation

- GHG mitigation
- Eco-efficiency
- Precision agriculture
- Smart Breeding
- Customized Feeding/Fertilization
- Saving Water management
- One Health Control

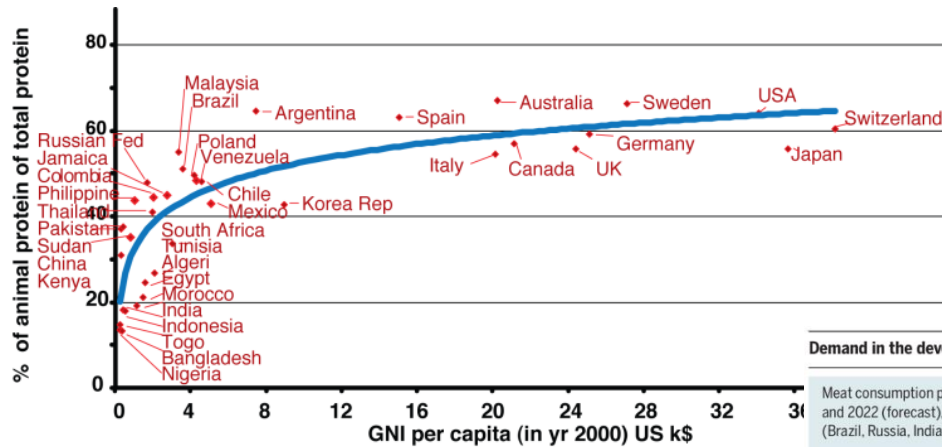


Global Nutrition Security

Healthy food and nutrition
for 9 billion people in 2050
within the capacity of our planet

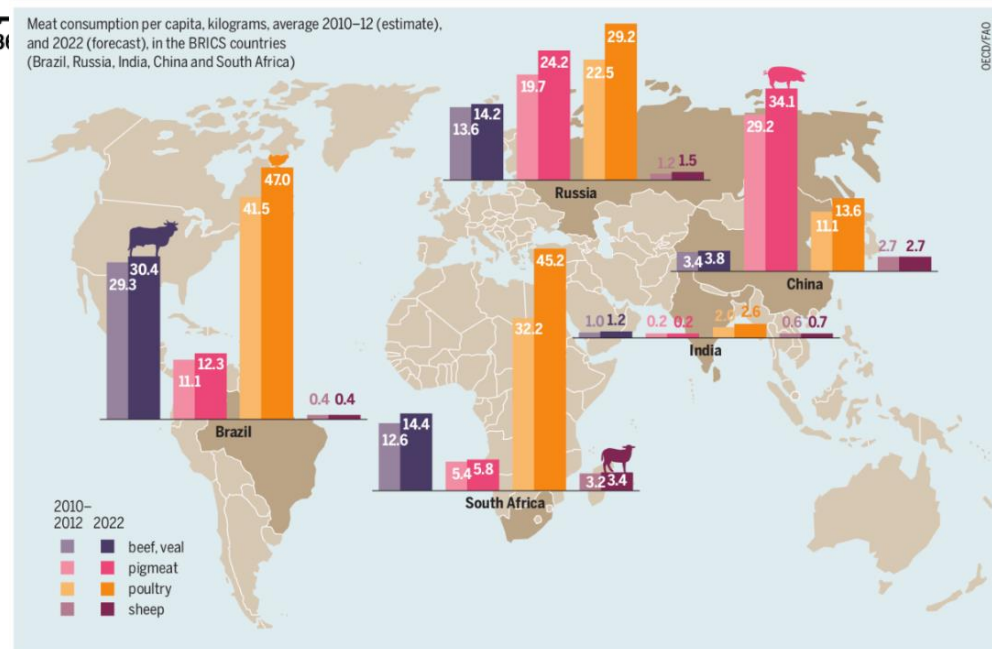


More Animal Proteins Demanded



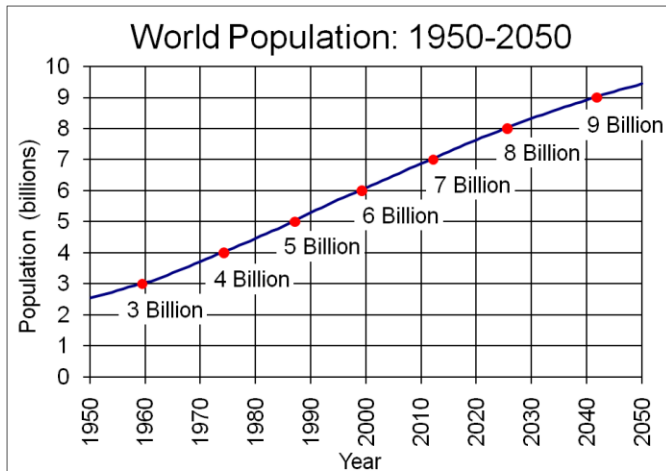
Demand in the developing world is rising steeply

Meat consumption per capita, kilograms, average 2010–12 (estimate), and 2022 (forecast), in the BRICS countries (Brazil, Russia, India, China and South Africa)



Perspectives of Livestock Production 2050

People



Source: U.S. Census Bureau, International Data Base, June 2011 Update.

Food



465 MT
+70%



1045
MT
+60%



110 MT
+60%

Feed



1000 MT
+35%



1,6 Gha
+15%



3,4 Gha
+0%

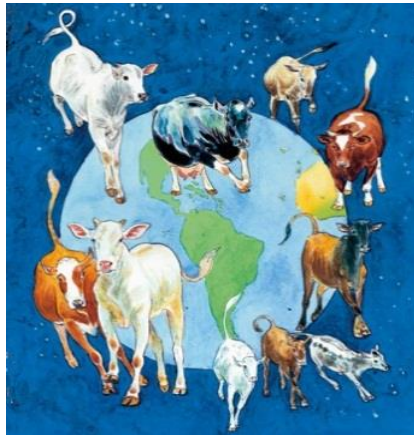
Meat Busters Required !!



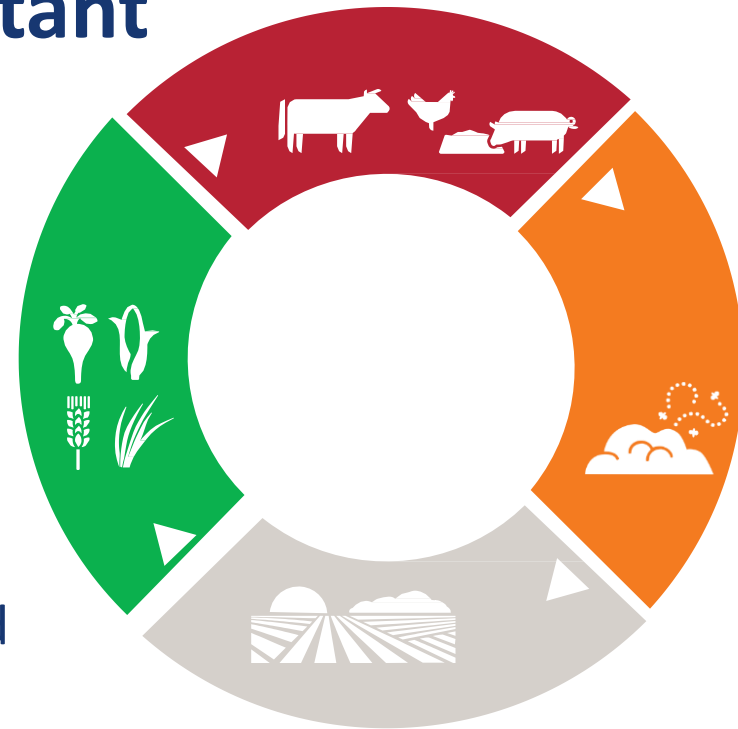
Scenario	GHG reduction	Land use reduction
Vegan	25-55	50-60
Vegetarian	20-35	30-50
“Red” by “white” meat	20-35	-

Hallström et al. 2015 (JCP)

Why Livestock is so Important



- Converts raw biomass in nutritious food
- Contributes to biomass cycling
- Serves the agro-ecosystem functioning
- Supplies demand for animal proteins and fatty acids with high nutritional value



Research Cooperation Changes the World



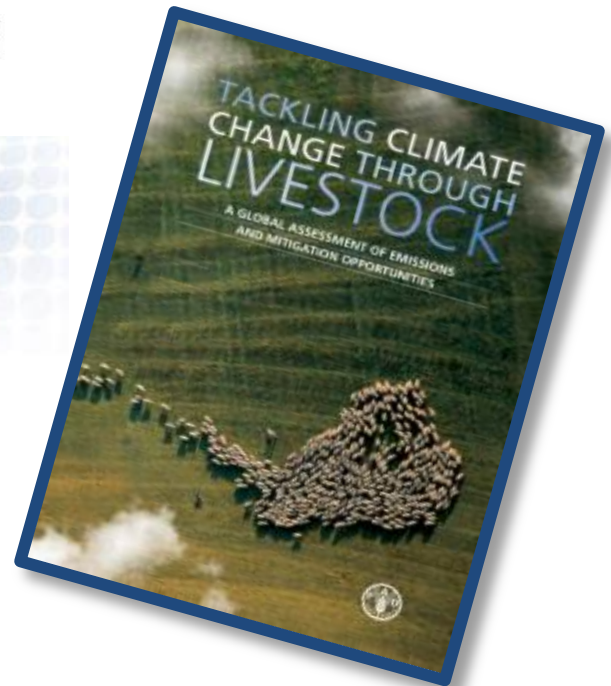
2007



GLOBAL AGENDA FOR
SUSTAINABLE LIVESTOCK

2013

GLOBAL
RESEARCH
ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES



GHG Mitigation Options



- Genotyping low methane production for selection
- Improving feed quality and digestibility
- Improving animal health and husbandry conditions
- Manure management: collection, storage and utilisation
- Improving C sequestration soils
- Precision livestock farming

Responsible Livestock Production



Ecological Footprint

C:



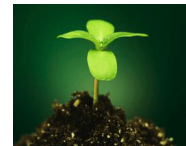
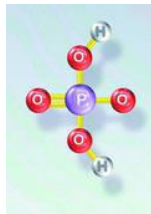
H2O:



Land:



P:



Social Needs

Animal Welfare

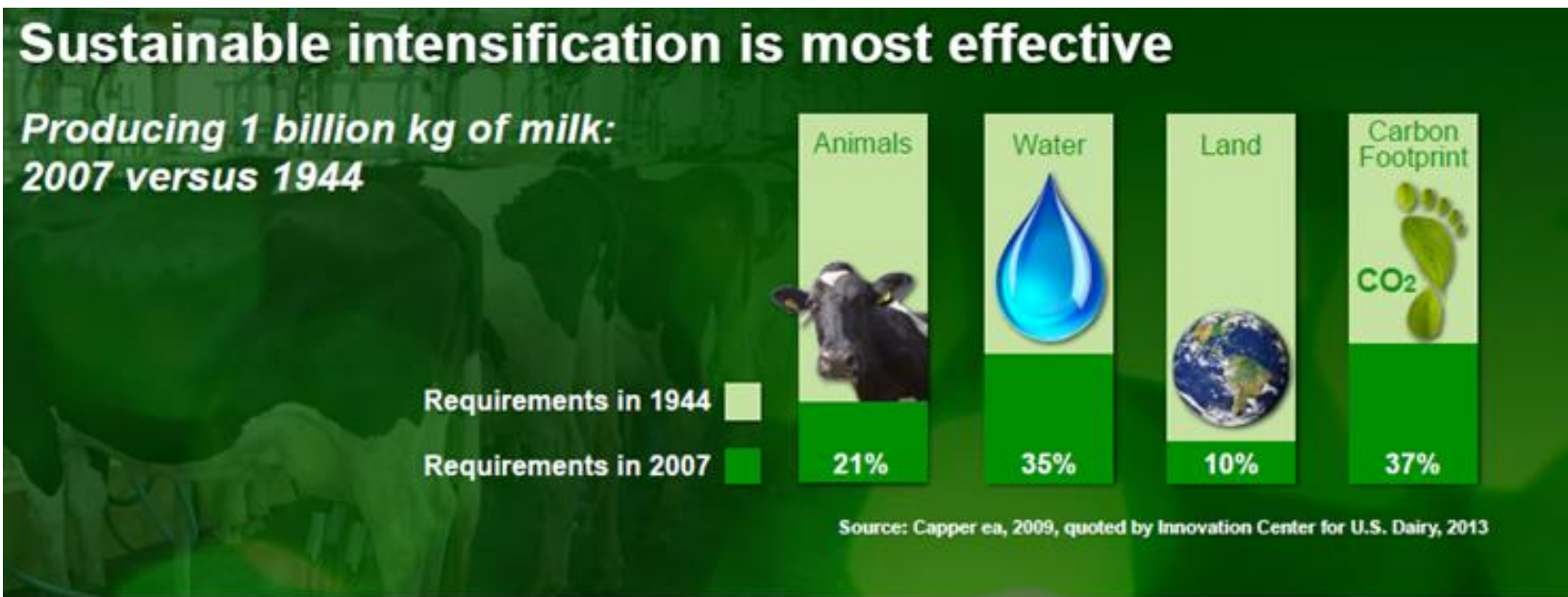
One Health

Livelihood

Fair Trade

Ecological services

Multiple Room for Improvement



Towards Sustainable Livestock Production

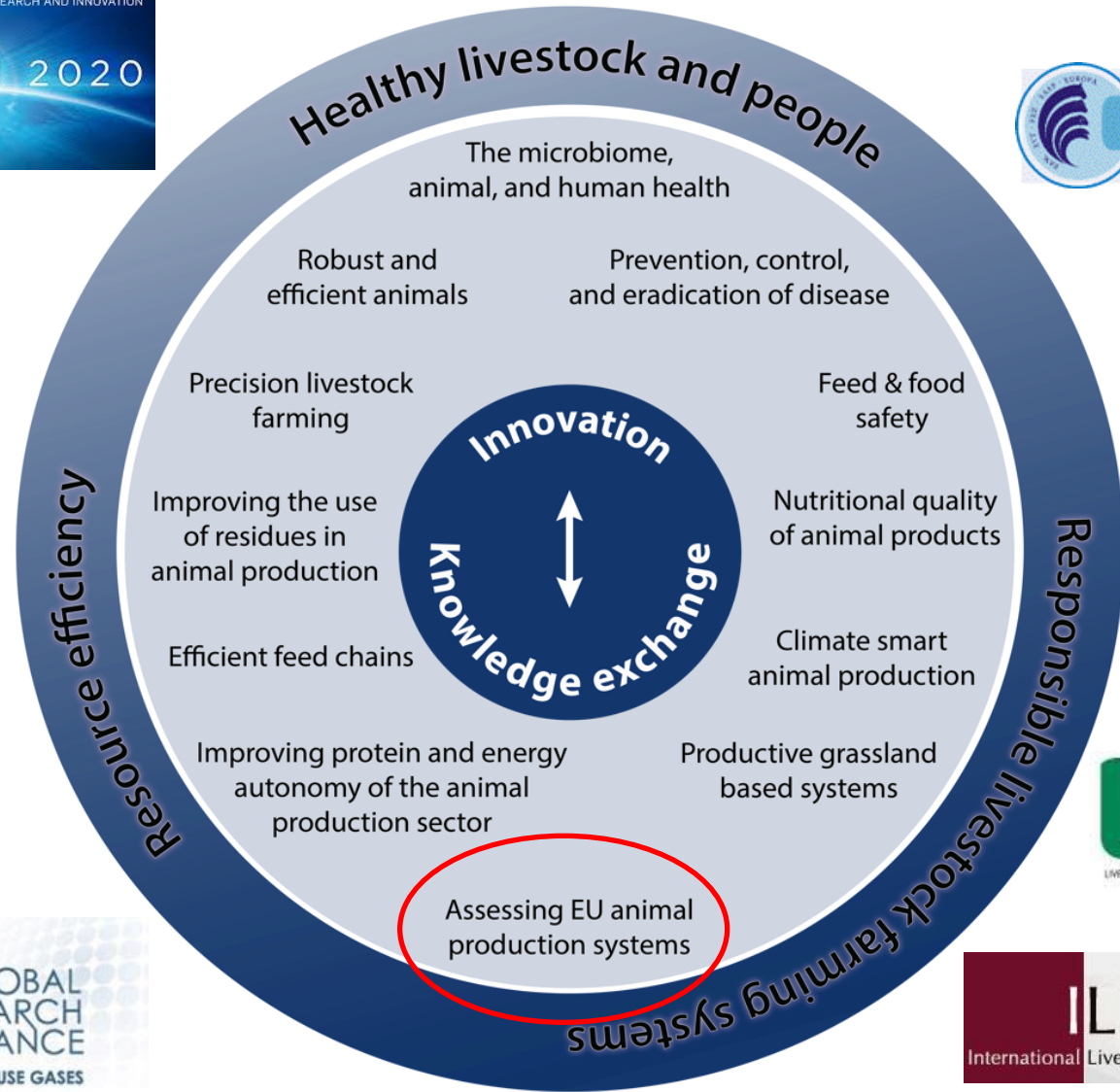


GLOBAL AGENDA FOR SUSTAINABLE LIVESTOCK



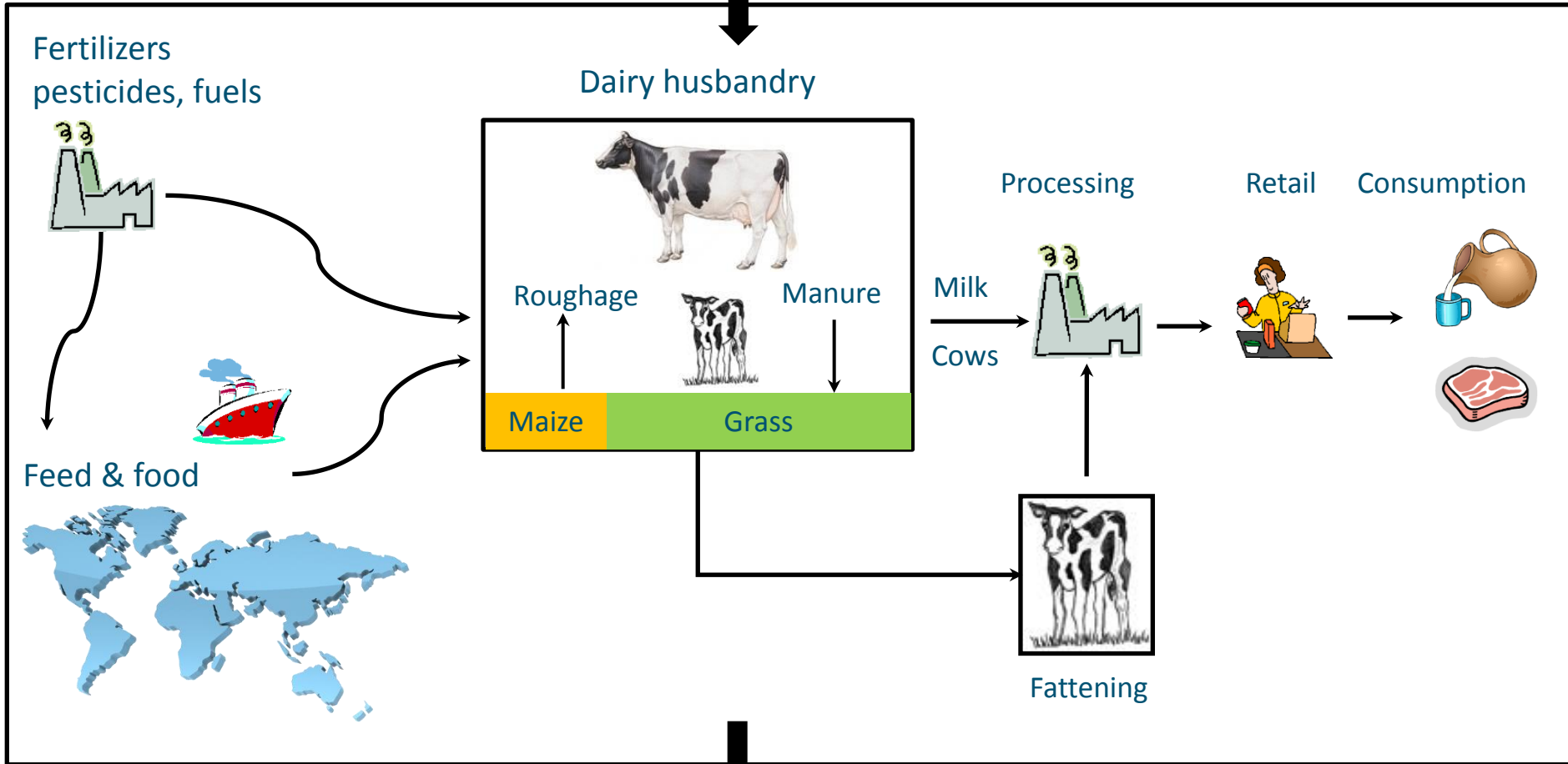
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GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES



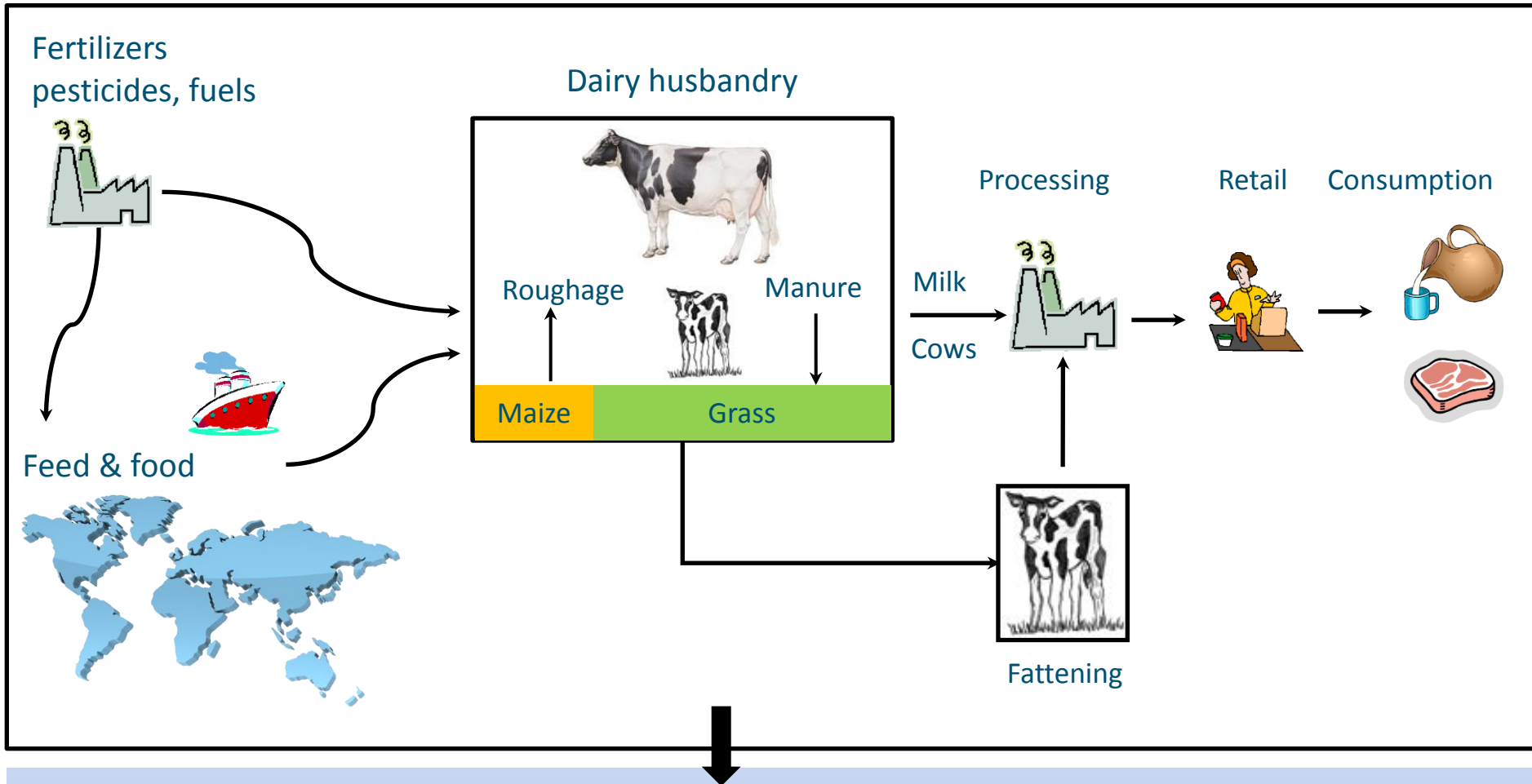
Life Cycle Assessment

use of resources



Emissions to air, water & soil

Carbon footprint: single issue LCA



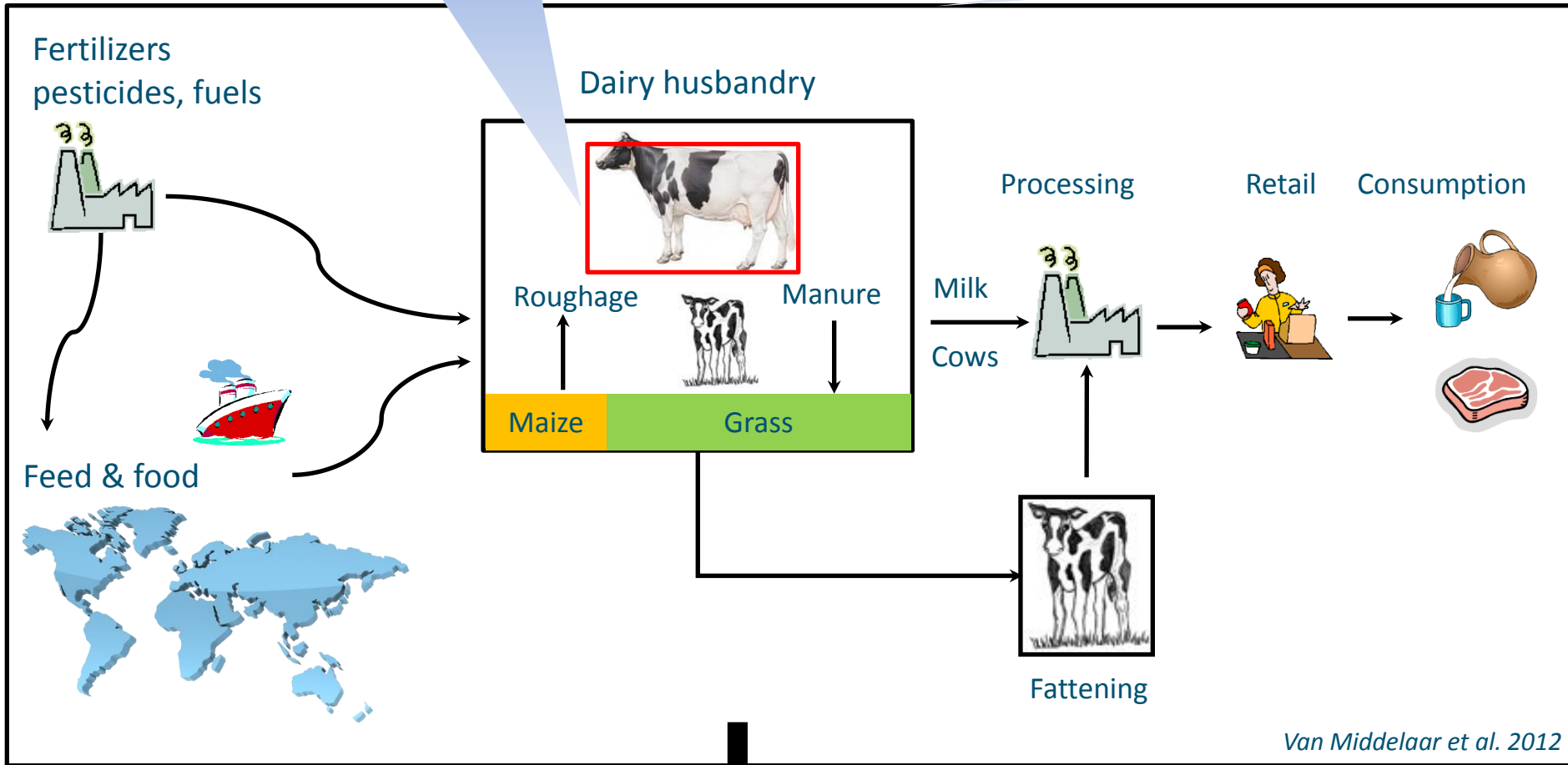
$$CO_2-e = 1 \times kg CO_2 + 28/30 kg \times CH_4 + 265 \times kg N_2O$$

Standard LCA ≠ a Global LCA.....

Replacing grass silage with maize silage

Immediate reduction

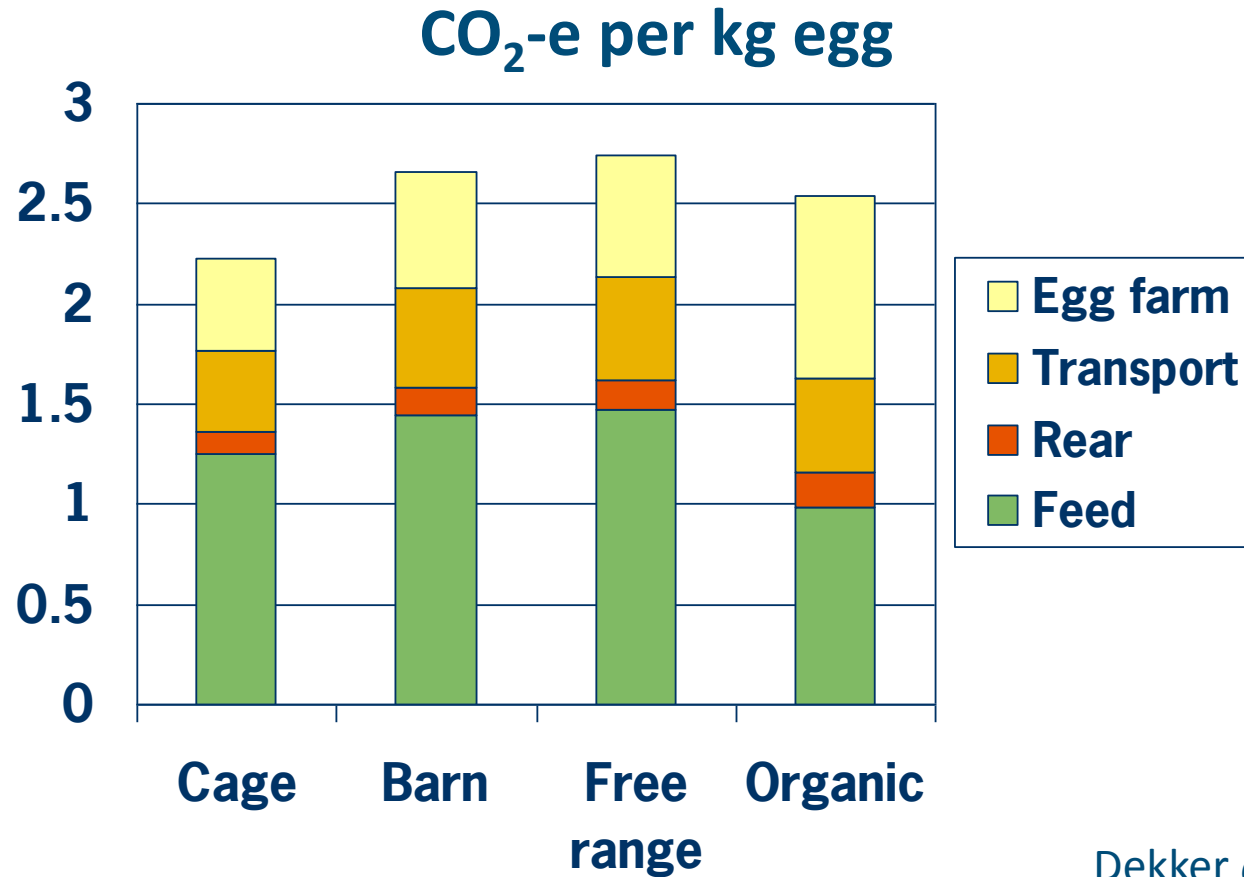
Reduction after 60 years



Van Middelaar et al. 2012

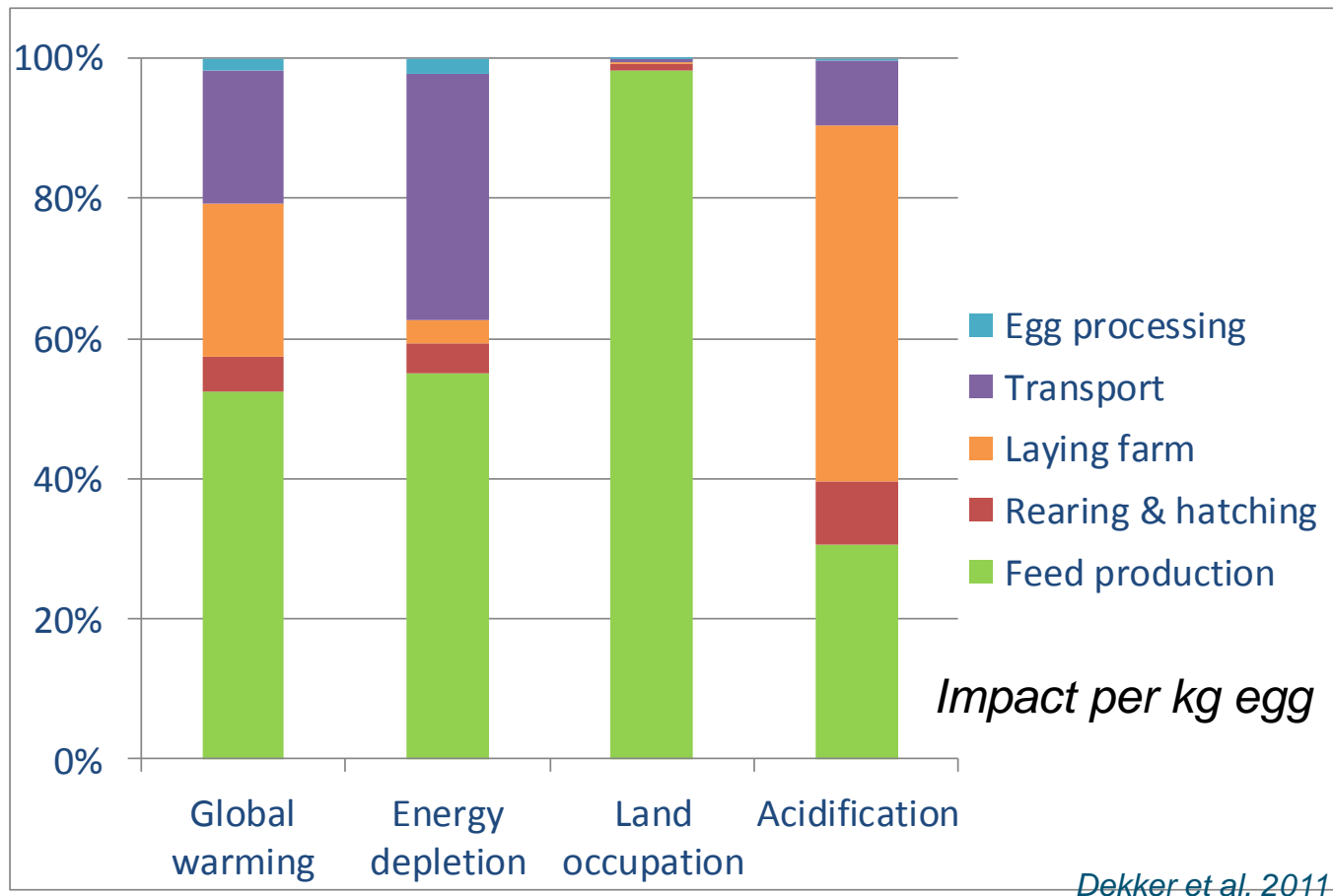
Greenhouse gases: CO_2 , CH_4 & N_2O

Evaluation Production Systems



Dekker *et al.* (2010)

Identification Impact Spots (*barn system*)

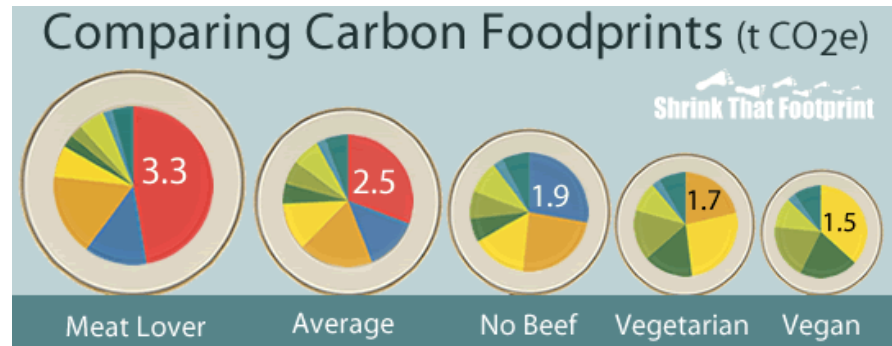
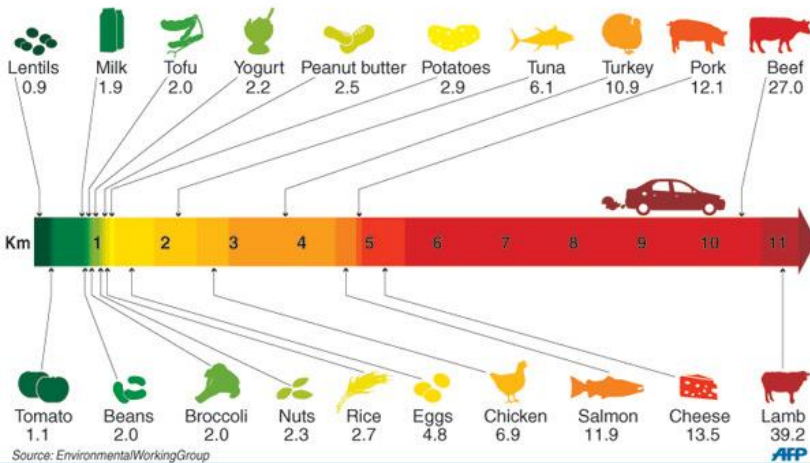


Comparing diets?

Carbon footprint of what you eat

Calculations of greenhouse gas emissions from the production, processing and transportation of specific food items

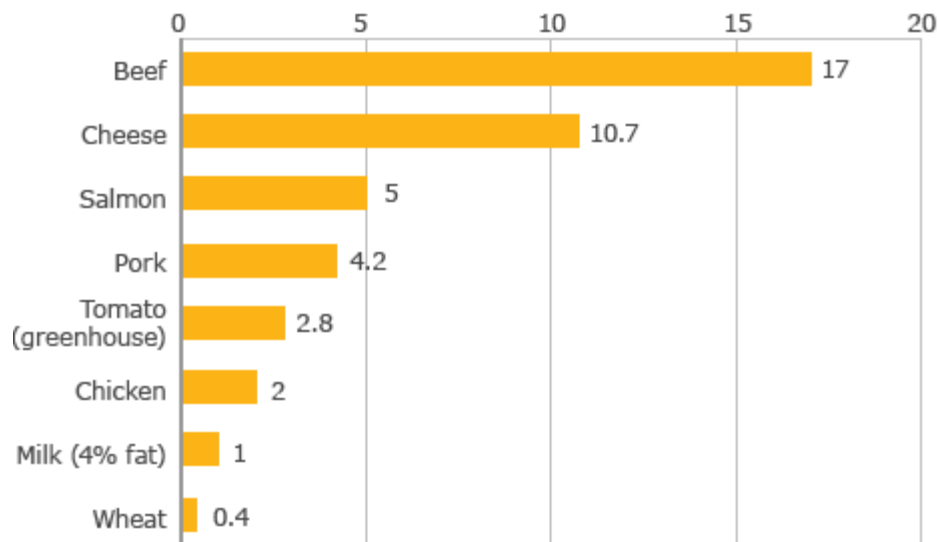
- Main chart compares 110g of food against a journey in a mid-sized car
- Number shows kg of carbon dioxide equivalent produced per 1kg of food



Demand Side Mitigation: Too Simplistic

The carbon footprint of food

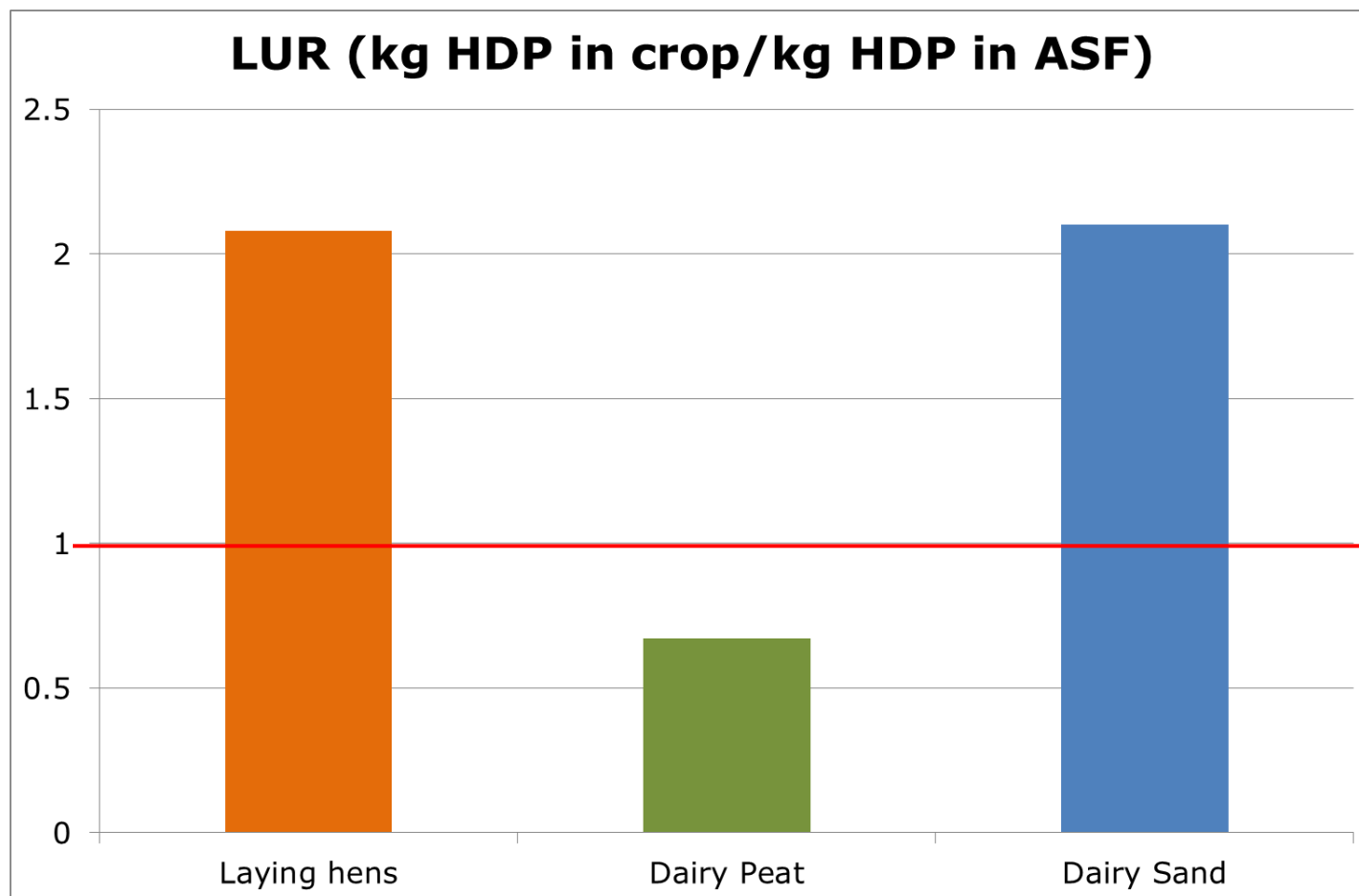
Kg CO₂/Kg



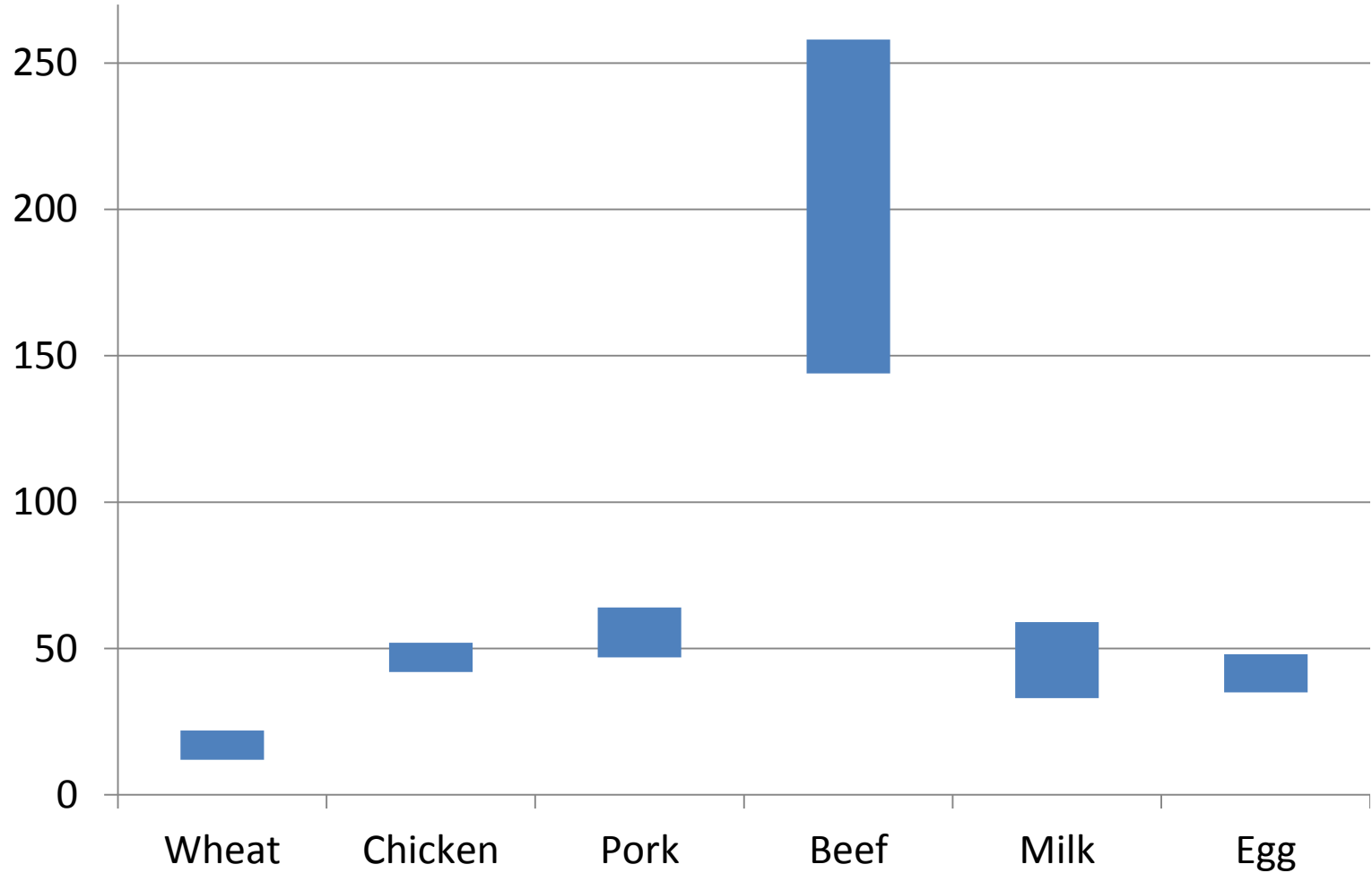
Source: Lantmannen Foods

- Summing up LCA's single products in a Linear Model
- Do not account for integration in a Global Agro-Ecosystem
- Do not envisage optimal land use for human protein production
- Ignore the Feed for Food Footprint

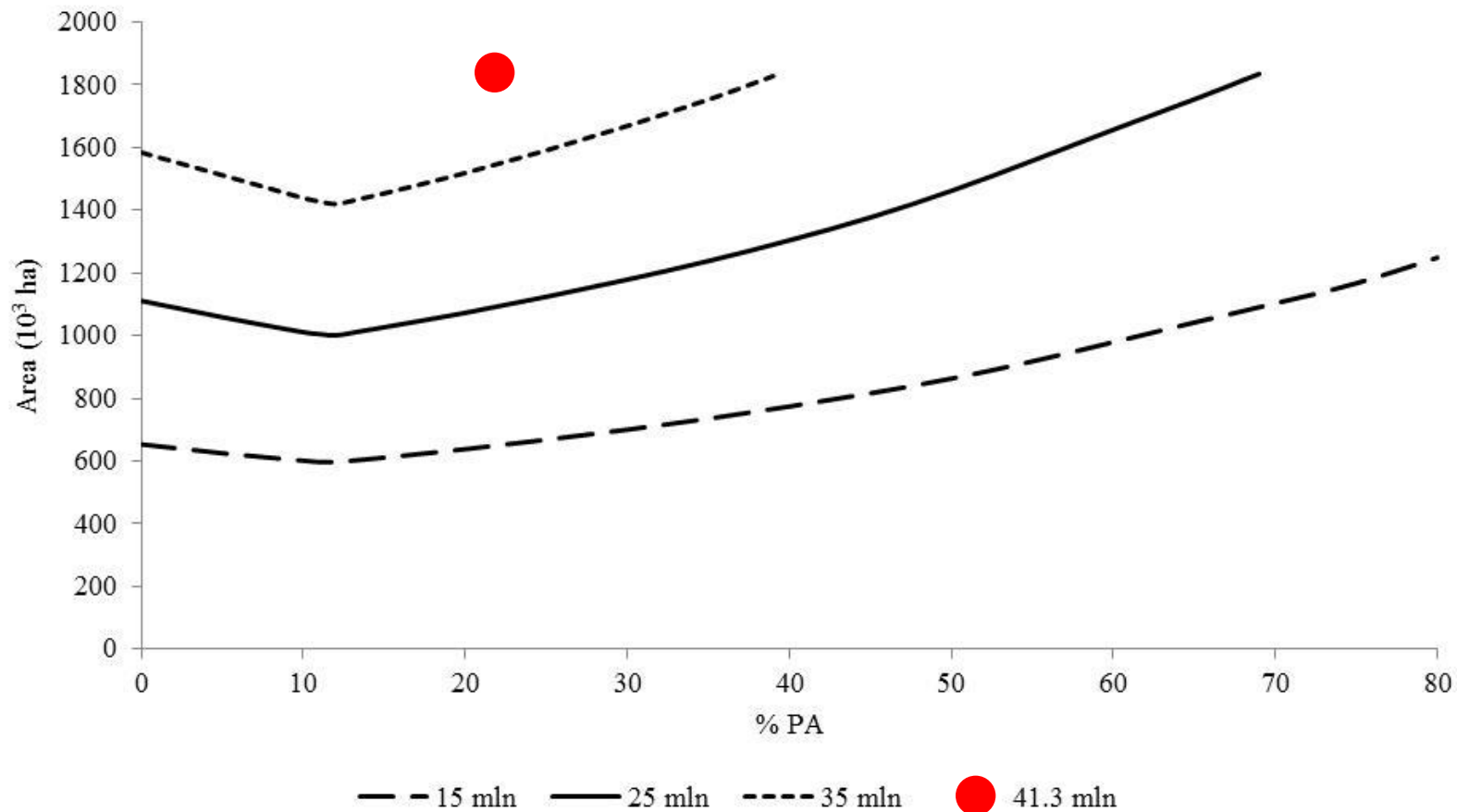
Alternatives 1: Land Use Ratio



Classical land-use-efficiency is false

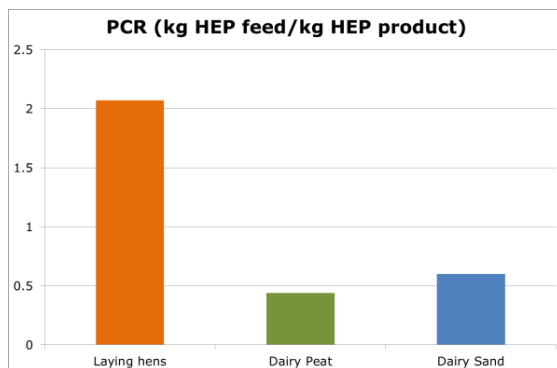


Land Needed for Diets Varying in %PA

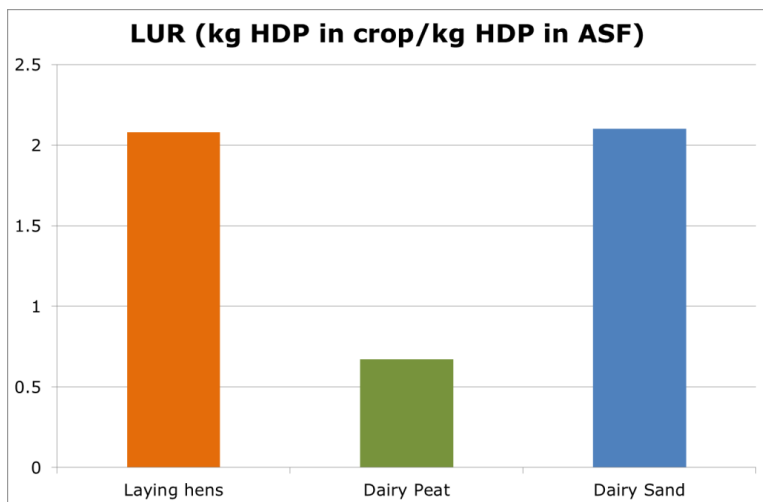


Alternative 2 : Protein Security

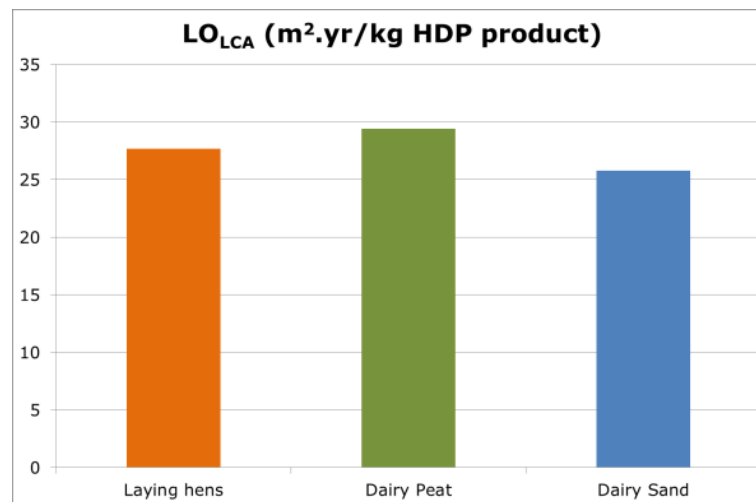
Protein Conversion Ratio



Land Use Ratio



Land Occupation

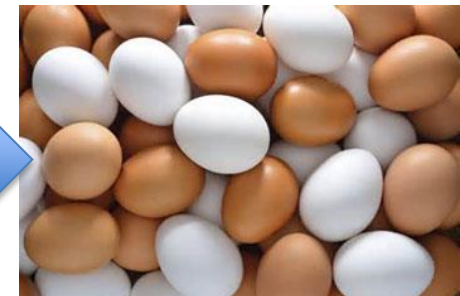
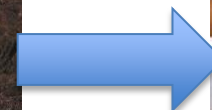
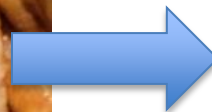
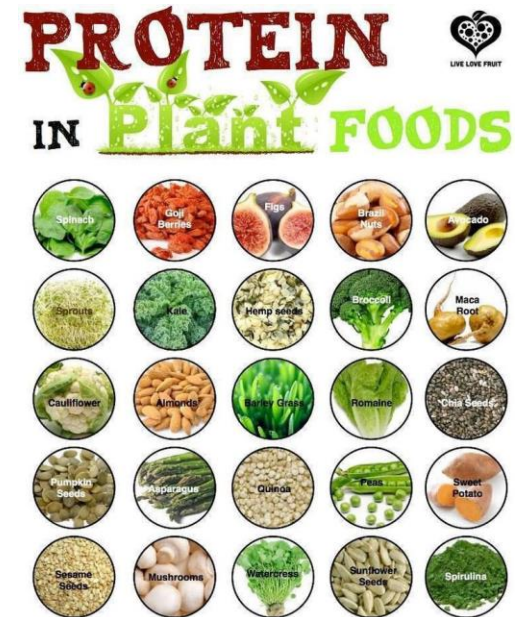


Protein Management

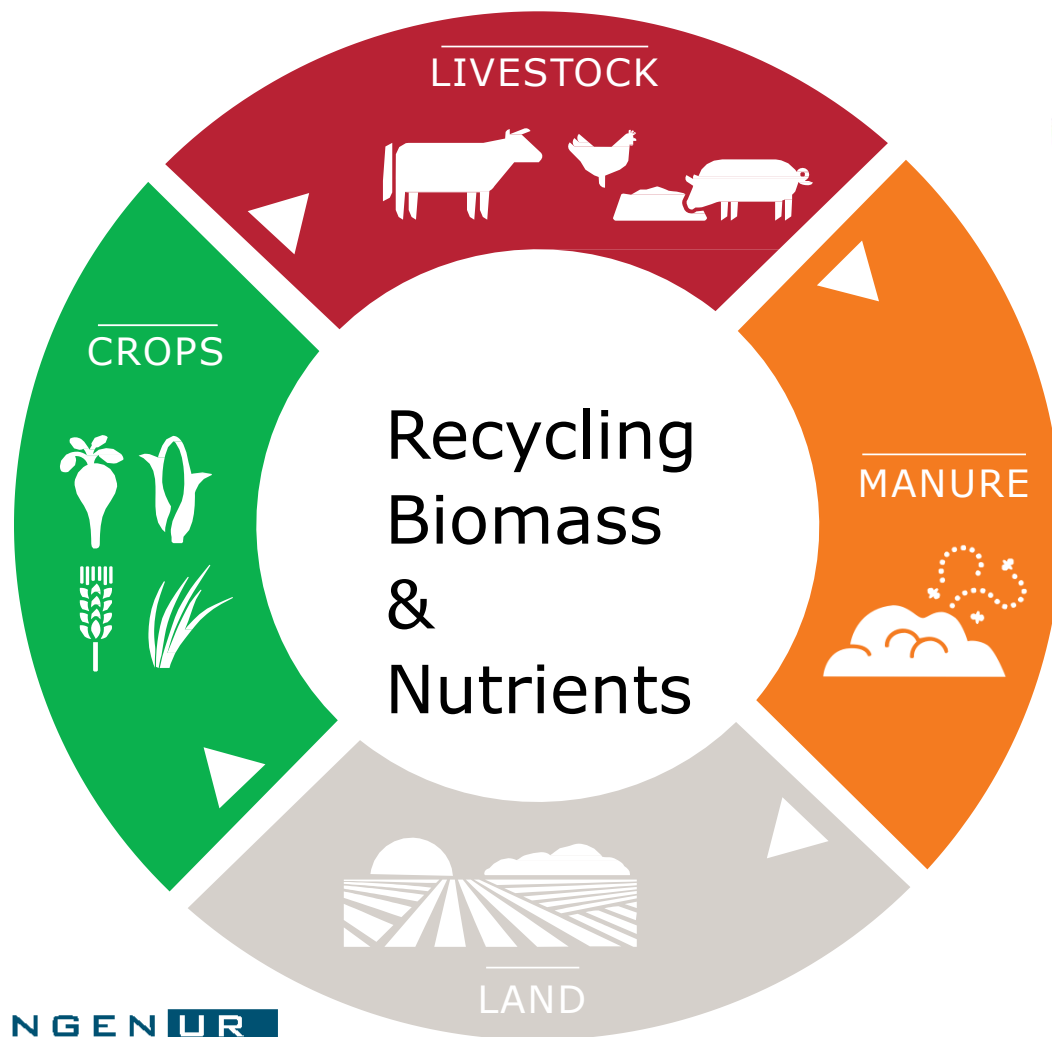
- Local protein alternatives



- Other protein stocks
(circular biomass based economy)



Remind: Agroecology = Circular Bio-Economy



Thanks!



Special Acknowledgment:
Prof. Imke de Boer