THE GREAT FOOD TRANSFORMATION:
PLANT BASED FOOD IN A GLOBAL PERSPECTIVE

BY
SUSTAINABLE INTENSIFICATION
LEGUMES
FRUITS
VEGETABLES
NUTS
WHOLE GRAINS

Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. January 16, 2019
OFFICIAL DANISH DIETARY RECOMMANDATIONS 2021

- Increase consumption of legumes and vegetables, decrease meat
- Plant rich food is healthy to the body and good for the climate
- Climate impact can be decreased about 50% if all animal products are taken out

Eat a variety of foods, but not too much, and be physically active
Eat fruits and many vegetables
Eat more legumes and fish
Choose whole grains
Choose lean meats and lean cold meats
Choose low fat dairy products
Eat less saturated fat
Eat foods with less salt
Eat less sugar
Drink water
CO₂-emissions from agricultural production - globally
PROTEIN’S INFLUENCE ON ENVIRONMENT - LCA

**Average GHG emissions**

<table>
<thead>
<tr>
<th>Protein Source</th>
<th>GHG Emissions (kg of CO₂ equivalent per 100 g of protein)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef (beef herd)</td>
<td>10</td>
</tr>
<tr>
<td>Lamb and mutton</td>
<td>20</td>
</tr>
<tr>
<td>Beef (dairy herd)</td>
<td>30</td>
</tr>
<tr>
<td>Crustaceans (farmed)</td>
<td>40</td>
</tr>
<tr>
<td>Cheese</td>
<td>50</td>
</tr>
<tr>
<td>Pig meat</td>
<td>60</td>
</tr>
<tr>
<td>Fish (farmed)</td>
<td>70</td>
</tr>
<tr>
<td>Poultry meat</td>
<td>80</td>
</tr>
<tr>
<td>Eggs</td>
<td>90</td>
</tr>
<tr>
<td>Tofu</td>
<td>100</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>110</td>
</tr>
<tr>
<td>Other pulses</td>
<td>120</td>
</tr>
<tr>
<td>Peas</td>
<td>130</td>
</tr>
<tr>
<td>Nuts</td>
<td>140</td>
</tr>
<tr>
<td>Grains</td>
<td>150</td>
</tr>
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**Average land use**

<table>
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<th>Protein Source</th>
<th>Land Use (m² per year per 100 g of protein)</th>
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CARBON FOOTPRINT OF LEGUME PROTEINS

EXERCISE

Go to Frida – the Danish food database, pick Legumes under Vegetables:
https://frida.fooddata.dk/food/lists/grouped/37?lang=en&#group37

Go to Concito’s The Great Climate Database, pick the categories Grøntsager and Korn-/gryn-/bælgfrugtprodukter:
https://concito.dk/projekter/store-klimadatabase

In groups of two or one by one: Calculate and compare carbon footprint of a group of legumes e.g. raw, frozen and mature peas, or mature peas, fababean and lentil.....

Discuss on class what you found
LOCATION AND MANAGEMENT INFLUENCE LCA

Heusala et al. (2020)
DIVERSITY FROM PLANT GENETIC RESOURCES

Protein content (g) per pea plant

Ambo 0.83 0.72 1.60
Kelwo 0.72 0.87 1.16
Moro 0.87 1.38
Movi 1.16
Bons 1.38
N309 1.42
ESO 1.25
Auris 1.25
Astro 1.25
Nava 1.03
Rhein 1.07
Tore 0.96
King 1.11
Stal 1.24
Pro 1.36
Koto 1.21

Skyum (M. Sc. Thesis FOOD 2020)
FABAA BEAN GROWN AS A VEGETABLE
INTERCROPPING FABA BEAN AND CABBAGE

Legume: less competition → greater overall yield

Shanmugam et al. (2022)
INTERCROPPING FABA BEAN AND CABBAGE

- Complementary root systems and resource use
- Reduced N leaching loss in intercropping
- Diversity doubled

Shanmugam et al. (2022)
MORE LEGUMES IN PRODUCTION SYSTEMS

EXERCISE

Please discuss in groups of two or three:

Pros and cons for more legumes in field production consequences for the

• agro-ecosystem,
• landscape,
• farmer and
• society in a broader sense

Sum-up in class
LEGUME CROPS: **HIGH VALUE CROPS**

- Fix nitrogen for precrop effect as fertilizer
- Essential in organic agriculture and new low input systems
- Organic matter increases soil fertility
- Stimulates carbon storage
- Attracts pollinating insects
- Increases biodiversity
- Decreases crop rotation diseases (‘break’ crop)
- New crops and products
- Improves food security (local food supply)

SureVeg-project
Tei et al. (2020)
Watson et al. (2017)
Literature


- Tei, F., De Neve, S., de Haan, J., Kristensen, HL (2020) Nitrogen management of vegetable crops. *Agricultural Water Management* 240 1 October 2020, 106316

