Future needs for protein

Recommendations from the Danish Bioeconomy Panel
How is Denmark becoming a frontrunner for bioeconomy?
The global protein challenge

Paris Climate Agreement: < 2,0 °C

Agriculture crops and cattle ranching drives deforestation, which is associated with the climate change problem

Production of soy outside the EU is associated with sustainability issues

Agriculture production has negative ecosystem effects

How to feed more than 9 billion people in 2050 in a sustainable way?

Increased demand for feed and food proteins
The market response

Demand for "locally" produced protein sources for feed,

In particular for market segments demanding non-GM and/or organic feed (dairy and aquaculture are first movers).

Meat consumption is decreasing in some countries and demand for new plant based proteins is increasing.

The EU protein plan is highly relevant
Comparative advantages for agricultural production - simplistic

Starch

Proteins
Protein

Denmark/North-/Middle-europe*

Demand, Non-GM-protein, more ”locally produced” sustainable protein supply
The organic sector
Environment and climate – targeted environment regulation, meeting the climate goals.
Interesting production possibilities – better utilization of bi-flows, alternatives for fallow areas.
Research and development areas

**Strengthening and prioritizing**
Ministry of Food and Environment, other ministries, universities, food sector, feed sector and the agri-business at farm level are strong partners in the field.
Roadmap for preventing deforestation
Problem the initiative aims to tackle

According to the FAO, 7.6 million hectares of forest were lost each year between 2010 and 2015, mainly in the tropics. While the rate of deforestation appears to have slowed compared to previous decades, it remains alarmingly high and has been increasing again since 2015.

An FAO report (2016) showed how agricultural expansion for the production of commodities (e.g. soy, beef, palm oil, coffee, cocoa) drives about 80% of all deforestation specifically in the tropical countries, while mining, urbanization and infrastructure are responsible for less than 10% each.

The EU is indeed among major global importers of a number of specific commodities associated with deforestation, i.e. palm oil (25% of global imports), soy (15%), rubber (25%), beef (41%), maize (30%), Cocoa (80%), and coffee (60%) (China) – big importer
Selected from the Roadmap

Basis for EU Interventions

What does the initiative aim to achieve and how

Possible actions may include:
- Build effective partnerships with producer countries in the tropical domain to support the uptake of sustainable agricultural and forestry practices.
- Strengthen international cooperation with other major consumer countries.
THE DEVELOPMENT OF PLANT PROTEINS IN THE EUROPEAN UNION

OPPORTUNITIES AND CHALLENGES

22 & 23 NOVEMBER 2018 - VIENNA


Rudolf Mögele, Deputy Director-General, DG Agricultural and Rural Development, EU Commission
EU use of protein and their sources
(in million tonnes of crude proteins 2016/17)

<table>
<thead>
<tr>
<th>Protein Source</th>
<th>Import</th>
<th>EU Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulses</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Soyabean Complex</td>
<td>14.3</td>
<td></td>
</tr>
<tr>
<td>Rapeseed Complex</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Sunflower Complex</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Dried Fodder Legume</td>
<td>3.5</td>
<td></td>
</tr>
</tbody>
</table>
Three main market segments for plant proteins

- Conventional compound feed
- Premium feed
- Food
Conventional Compound Feed

- By far the largest outlet for plant proteins (more than 75%)
- Growth rates for compound feed will slow down, to 0.3% per year until 2030
- Higher growth rates for animal products in Eastern Europe
- Most dynamic sectors are feed for poultry and dairy
- Market mainly price driven
- **Limited prospects for EU-grown protein crops**
Premium Feed

- Share of **non-GM feed** is growing dynamically (2012 11% in EU, in 2018 ?)
- Also substantial growth rates in **organic production** of animal products, on average 10%
- Shares of organic dairy production surpass 10% in some Member States
- **Main features**: growing demand for sustainably produced animal products, labelling new regional supply chains but also possibility to use of existing supply chains, sourcing issues/year-round availability not ensured
Food segment

- Small market with promising prospects: e.g. dairy and meat alternatives 11% and 14% per year
- **Pulse-rich diets** become more popular through changing diets (in some Member States)
- The different outlets still status of **niche markets**
- Interest of major food companies and retailers
- Trend driven by flexitarians
- **High profit margins** but need to further build supply chains

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**Legend:**
- Dairy alternatives
- Meat alternatives

**Note:**
- Federal Ministry
  Republic of Austria
  Sustainability and Tourism
Agronomic, environmental and climate benefits of legumes

Benefits:
- Fertilising effect in crop rotation
- Increase yields of following crops
- Improve soil condition
- Break pest cycles
- Positive effects on biodiversity

Challenges:
- Yield variability and yield gaps
- Relatively demanding on agronomic practices (pest and weed control)
- Low agronomic expertise
- Environmental benefits not automatic
Policy instruments and initiatives today

- Main **CAP instruments** supporting protein plants:
  Greening: 27 Member States allow legumes on EFA area
  Rural development programmes with AECM
- VCS: 16 Member States use VCS in 2019
- **Research**: EIP-AGRI (14 programmes) & Horizon2020 (4 programmes)
- In addition **Member State initiatives**, e.g.
  national plans in Germany, France and Poland
- National Policy initiatives closely linked to protein, e.g.
  Dutch Food Policy and Danish National Bioeconomy Panel
- **European Soya Declaration**
Conclusions

Main drivers for future development of EU-grown plant proteins:

- Relative competitiveness versus other crops and non-EU plant proteins
- Supply chain development and producer organisations
- Recognition of legume’s contribution to environmental and climate targets
- Evolving consumer behaviour and preferences
- Influence of other policies and debates in society (deforestation, SDGs, Renewable Energy Directive, European Bioeconomy Strategy)
Way forward

Five options for further action:

- Use opportunities in proposed future CAP: support Member States in integrating them in strategic plans
- Continue to boost competitiveness through Research and Innovation
- Improve market analysis and transparency
- Promote benefits of plant protein for nutrition, climate and environment
- Increase sharing of knowledge/best practice
Vision

”Within five years alternative Danish protein products with a better environmental and climate footprint can match existing protein products regarding price and quality in key market fields within feed and food.”
How the panel has worked

New proteins from land

New proteins from sea

New proteins from residual and secondary flows

Food (such as ingredients for food production and insects)

Feed (such as protein additives to feed mixtures)

Other products (such as pharmaceutic as and fertiliser)
Targets

1
Within five years a commercial production of sustainable protein-rich raw materials from land based production, aquatic sources, and from industrial residual and secondary flows has been established.

2
In a relatively short number of years, close to one third of Denmark’s imports of feed proteins has been replaced by feed proteins based on Danish protein sources. Danish produced protein sources must be economically and environmentally sustainable, and the functionality of the products must be at least equal to that of existing products.

3
Danish companies have established solid business cases for biorefining of protein-rich land and marine based biomass and of industrial secondary flows.

4
The Danish market for new protein products for feed and food has increased by more than 50 percent annually, knowledge is available on environmental and climate footprints, and there is transparent traceability.

5
There is an ambitious political orientation towards a sustainable bioeconomy in Denmark. Strong partnerships exist for biorefining, among others, and companies have easy access to 13 public and private capital.
15 recommendations for national action

6 are on bioeconomy in general:
1. A bioeconomy strategy
2. Coordination of investments in Research, development and Innovation
3. More funds to bridge the valley of death
4. Incubation and acceleration facilities for SME and start-ups
5. Activate venture capital
6. Skills and competences

9 protein specific:
7. Research and development in raw materials for new protein value chains.
8. Recognition of sustainable biomass production in national environmental regulation.
9. Improved EU framework conditions for sustainably produced proteins
10. Stronger coordination among stakeholders
11. Support for research, development, and establishment of biorefineries
12. More knowledge about market and consumer demand
13. Consensus on environmental and climate footprints of proteins
14. Support for nutritional and toxicological studies
15. Secure that traceability systems underpin new protein products for food and feed.
Imported plant protein accounts for 39% of the protein consumption in Danish animal production. 64% of the imported feed protein is derived from soy.

National production of protein for feed in mio. kilos:
Protein challenge for the organic sector in Denmark

Total import value of organic feed and cereals is more than 100 million Euro in 2017.

This amount corresponds to the total yield from 75-100,000 ha. arable land which is 3-4 % of the total agricultural area in Denmark.

Meeting this demand nationally would increase the need for organic production land by app. 50%.
Total EU soy import – DK share

EU imports of soy – eq. 32 mio. tonnes soy bean meal
- Soy bean 14 mio. tonnes
- Soy bean meal 25 mio. tonnes

EU imports of soy – eq. 32 mio. tonnes soy bean meal
- Total EU
- DK
DK Bioeconomy panel: “1/3 of DK soy import could be replaced within a few years”

1.8 mio. tonnes soy total import = 0.85 mio. tonnes protein

1/3 equal to app. 0.3 mio. tonnes protein

How?
At EU level

32 mio. tonnes soy total import = 15 mio. tonnes protein

1/3 equal to 5 mio. tonnes protein

How?
Three development tracks

- Grass biomass
- Protein crops
- Other new protein value chains
Grain crops utilize only a part of the growing season

Potential for increase in biomass production - Perennial grasses?

Source: Uffe Jørgensen, Aarhus University
Track 1
Perennial grasses/clovers – an efficient utilisation of arable land

Track 2
New faba bean varieties for Danish production of protein
Track 3

Other new protein value chains; eg. Starfish, mussels, insects and seaweed
# Danish protein supply in the future

<table>
<thead>
<tr>
<th>Track</th>
<th>Biomass</th>
<th>Hectares</th>
<th>Volume of protein (t)</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grasses and clovers</td>
<td>100.000</td>
<td>100.000</td>
<td>Low TRL*, protein quality</td>
</tr>
<tr>
<td>2</td>
<td>Legumes</td>
<td>100.000</td>
<td>100.000</td>
<td>Plant breeding</td>
</tr>
<tr>
<td>3</td>
<td>Seaweed, starfish and mussels</td>
<td>-</td>
<td>15.000</td>
<td>Low TRL lack of areas for production sites</td>
</tr>
<tr>
<td></td>
<td>Microbes, bacteria and insects</td>
<td>-</td>
<td>25.000</td>
<td>Regulation, low TRL</td>
</tr>
<tr>
<td></td>
<td>Blood</td>
<td>-</td>
<td>10.000</td>
<td>Cost of handling and processing</td>
</tr>
<tr>
<td></td>
<td>Sidestreams from oil, flour, mash and starch</td>
<td>-</td>
<td>50.000</td>
<td>Low TRL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>300.000</strong></td>
<td></td>
</tr>
</tbody>
</table>

* = Technology Readiness Level
Example:
Research project on new faba bean varieties.

NORFAB: Protein for the Northern Hemisphere

Like other EU countries Denmark is a net importer of protein, mainly soybean-meal from US and South America.

The imported protein is crucial for sustaining a large livestock production and also represents an important food ingredient.

The challenge is to increase domestic protein production and maintain global competitiveness while improving agricultural diversity and sustainability. ...

Supported by the Danish Innovation Foundation
CID in a nutshell

New research

Plant breeding

Research frontier

CID momentum - Strategic innovation
Vision

"...Accelerate breeding progress to solving challenges in plant production...."

Mission

"...Prioritize, Coordinate and launching new activities..."
CID 2023 Strategy

Det vil CID de kommende år

Stimulate the development of new improved crops and varieties focusing on improved climate, environmental, quality and productivity effects in plant production.

Strategic platforms:
- Root research
- Genomic selection,
- Protein crops
- Preceission breeding

CID cooperation must be further developed so that we in Denmark are among the best in the world for collaboration between companies and knowledge institutions.
NEW Public-Private-Partnership

DANISH PROTEIN INNOVATION

The aims:
- Coordinated research initiatives within new protein value-chains
- The first goal is to produce feed protein for pigs and poultry from grass in big scale
- Initiative based on national recommendations
Danish Protein Innovation

DPI's purpose is to promote and coordinate research and innovation to increase market-based and sustainable Danish production of protein for food and feed.
The DPI board
Nye proteinværdikæder

- Nye proteiner fra land
- Nye proteiner fra havet
- Nye proteiner fra rest- og udsatstrømme

Råvarer

Forarbejdning og teknologi (f.eks. biorefinering)

Fødevarer (f.eks. ingredienser til fødevarerprodukter og medicin)

Foder (f.eks. protein- tilsvarende) i dyrkæden

Andre produkter (f.eks. Pharma og selkridning)

Marked
Action at EU – the right toolbox exists
Further Action at EU level Needed

Credit for production of biomass with positive environmental and climate effects

Flexible rules for perennial grass areas

Smooth regulation for approval of new proteins

High priority of bioeconomy in Horizon Europe for R&D (e.g. plant breeding/protein crops) and establishment of biorefineries

Consensus on environmental and climate footprinting methods for proteins

CAP support (top up) for production of protein crops
Minister for Environment and Food

Jakob Ellemann Jensen

15/3- 2019
DAKOFO Annual General Meeting
Thank you

www.mfvm.dk/miljoe/det-nationale-biooekonomipanel