Proteins for the Future

Recommendations from the Danish Bioeconomy Panel

Det Nationale
BIOØKONOMI
Panel

How is Denmark becoming a frontrunner for bioeconomy?

The global protein challenge

Paris Climate Agreement: < 2,0 ^{0}C

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

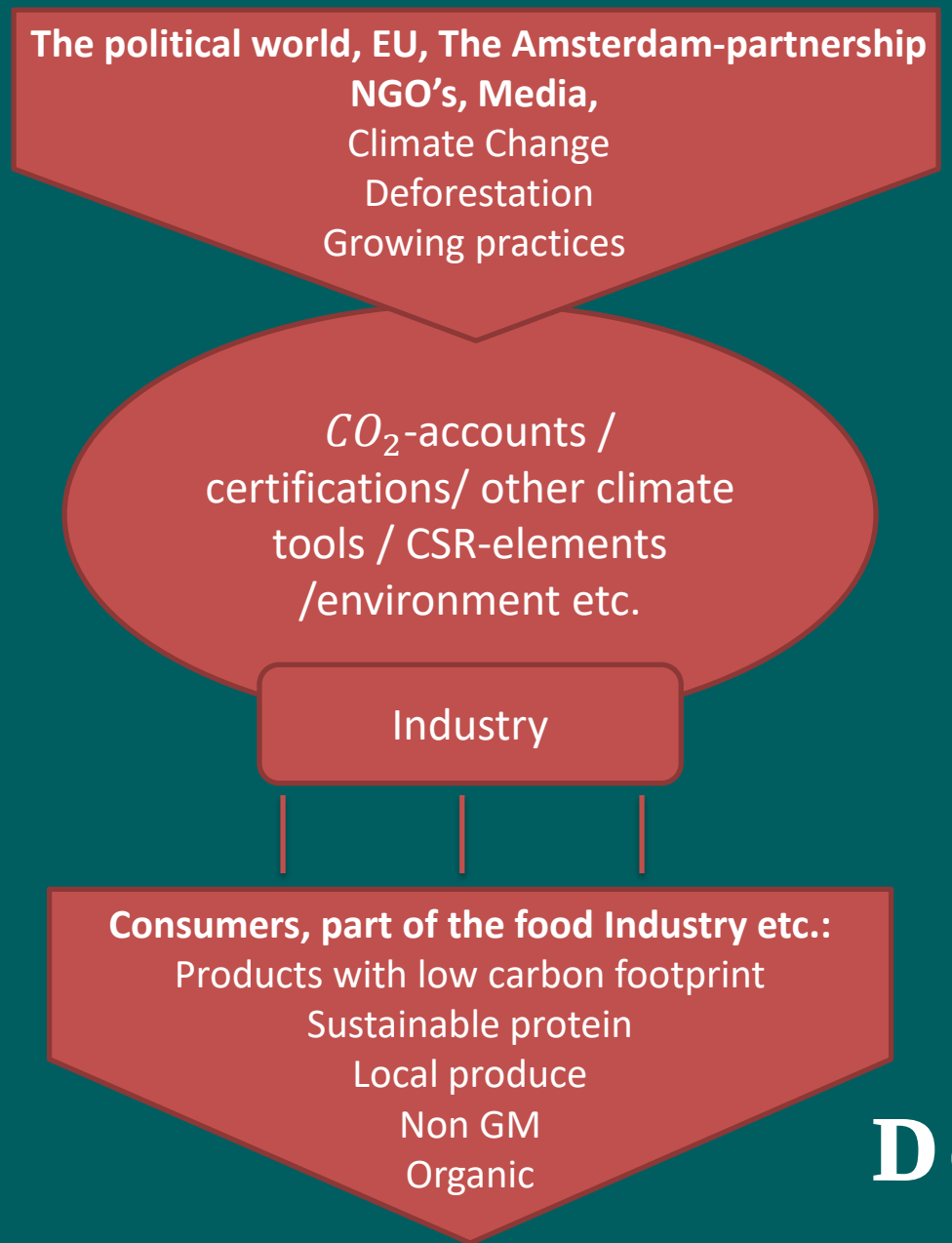
Production of soy outside the EU is associated with sustainability issues

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

Challenges - pressure



Demand - pull

Comparative advantages for agricultural production - simplistic

Starch

Proteins

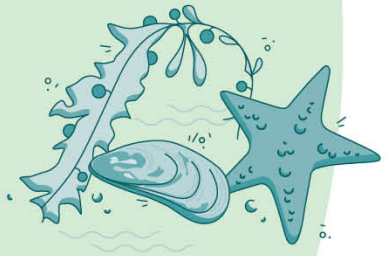
Vision

”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

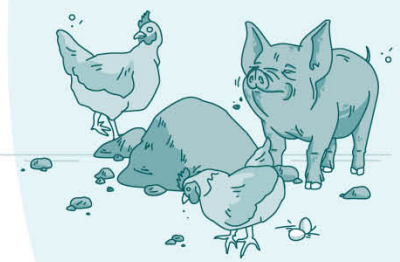
New proteins from land

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 landbased 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In a relatively short number of years, close to one third of Denmark's imports of feed proteins has been replaced by feed proteins based on Danish protein sources.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 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.

Three main market segments for plant proteins

Conventional compound feed

Premium feed

Food

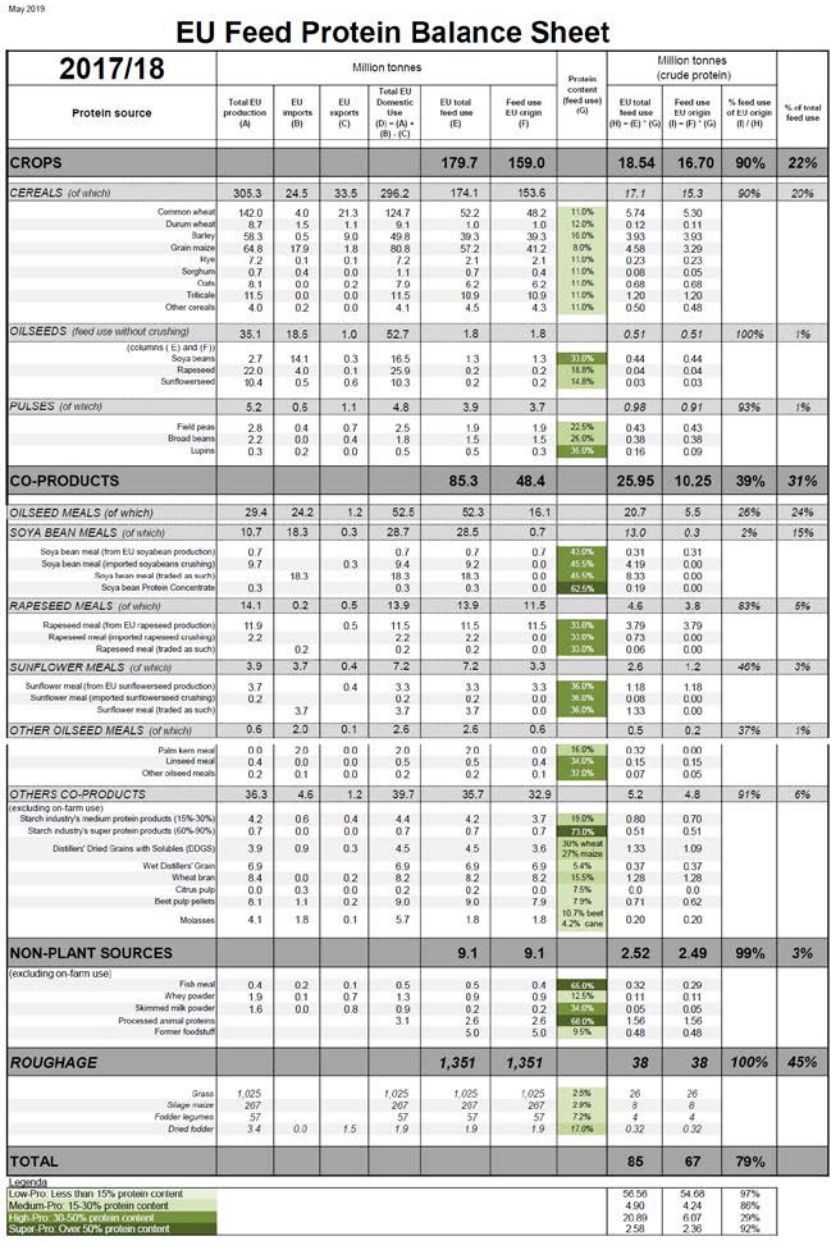
e 2 0 u 1 8 · a t Austrian Presidency of the Council of the European Union

Federal Ministry Republic of Austria Sustainability and Tourism

European Commission

Proteinbalance sheet EU

In the EU we have a self-supply at 79 % on protein when all protein is included - and it gives the most comprehensive description.



May 2019

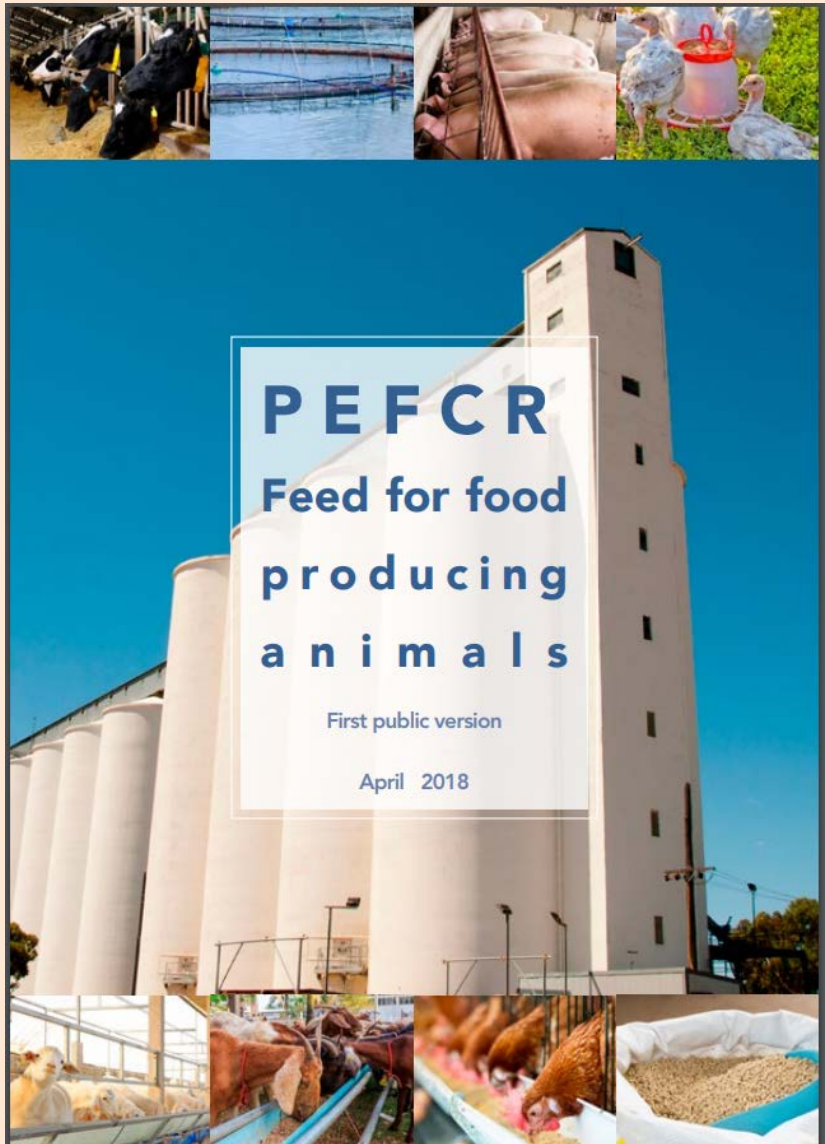
EU Feed Protein Balance Sheet

2017/18	Million tonnes							Million tonnes (crude protein)			
Protein source	Total EU production (A)	EU imports (B)	EU exports (C)	Total EU Domestic Use (D) = (A) + (B) - (C)	EU total feed use (E)	Feed use EU origin (F)	Protein content (feed use) (G)	EU total feed use (H) = (E) * (G)	Feed use EU origin (I) = (F) * (G)	% feed use of EU origin (I) / (H)	% of total feed use
CROPS					**179.7**	**159.0**		**18.54**	**16.70**	**90%**	**22%**
CEREALS (of which)	305.3	24.5	33.5	296.2	174.1	153.6		*17.1*	*15.3*	*90%*	*20%*
Common wheat	142.0	4.0	21.3	124.7	52.2	48.2	11.0%	5.74	5.30		
Durum wheat	8.7	1.5	1.1	9.1	1.0	1.0	12.0%	0.12	0.11		
Barley	58.3	0.5	9.0	49.8	39.3	39.3	10.0%	3.93	3.93		
Grain maize	64.8	17.9	1.8	80.8	57.2	41.2	8.0%	4.58	3.29		
Rye	7.2	0.1	0.1	7.2	2.1	2.1	11.0%	0.23	0.23		
Sorghum	0.7	0.4	0.0	1.1	0.7	0.4	11.0%	0.08	0.05		
Oats	8.1	0.0	0.2	7.9	6.2	6.2	11.0%	0.68	0.68		
Triticale	11.5	0.0	0.0	11.5	10.9	10.9	11.0%	1.20	1.20		
Other cereals	4.0	0.2	0.0	4.1	4.5	4.3	11.0%	0.50	0.48		
OILSEEDS (feed use without crushing)	35.1	18.5	1.0	52.7	1.8	1.8		*0.51*	*0.51*	*100%*	*1%*
(columns (E) and (F))											
Soya beans	2.7	14.1	0.3	16.5	1.3	1.3	33.0%	0.44	0.44		
Rapeseed	22.0	4.0	0.1	25.9	0.2	0.2	16.8%	0.04	0.04		
Sunflowerseed	10.4	0.5	0.6	10.3	0.2	0.2	14.8%	0.03	0.03		
PULSES (of which)	5.2	0.5	1.1	4.8	3.9	3.7		*0.98*	*0.91*	*93%*	*1%*
Field peas	2.8	0.4	0.7	2.5	1.9	1.9	22.5%	0.43	0.43		
Broad beans	2.2	0.0	0.4	1.8	1.5	1.5	26.0%	0.38	0.38		
Lupins	0.3	0.2	0.0	0.5	0.5	0.3	35.0%	0.16	0.09		
CO-PRODUCTS					**85.3**	**48.4**		**25.95**	**10.25**	**39%**	***31%***
OILSEED MEALS (of which)	29.4	24.2	1.2	52.5	52.3	16.1		20.7	5.5	*26%*	*24%*
SOYA BEAN MEALS (of which)	10.7	18.3	0.3	28.7	28.5	0.7		*13.0*	*0.3*	*2%*	*15%*
Soya bean meal (from EU soyabean production)	0.7			0.7	0.7	0.7	43.0%	0.31	0.31		
Soya bean meal (imported soyabeans crushing)	9.7		0.3	9.4	9.2	0.0	45.5%	4.19	0.00		
Soya bean meal (traded as such)		18.3		18.3	18.3	0.0	45.5%	8.33	0.00		
Soya bean Protein Concentrate	0.3			0.3	0.3	0.0	62.5%	0.19	0.00		
RAPESEED MEALS (of which)	14.1	0.2	0.5	13.9	13.9	11.5		4.6	3.8	*83%*	*5%*
Rapeseed meal (from EU rapeseed production)	11.9		0.5	11.5	11.5	11.5	33.0%	3.79	3.79		
Rapeseed meal (imported rapeseed crushing)	2.2			2.2	2.2	0.0	33.0%	0.73	0.00		
Rapeseed meal (traded as such)		0.2		0.2	0.2	0.0	33.0%	0.06	0.00		
SUNFLOWER MEALS (of which)	3.9	3.7	0.4	7.2	7.2	3.3		2.6	1.2	*46%*	*3%*
Sunflower meal (from EU sunflowerseed production)	3.7		0.4	3.3	3.3	3.3	36.0%	1.18	1.18		
Sunflower meal (imported sunflowerseed crushing)	0.2			0.2	0.2	0.0	36.0%	0.08	0.00		
Sunflower meal (traded as such)		3.7		3.7	3.7	0.0	36.0%	1.33	0.00		
OTHER OILSEED MEALS (of which)	0.6	2.0	0.1	2.6	2.6	0.6		0.5	0.2	*37%*	*1%*
Palm kern meal	0.0	2.0	0.0	2.0	2.0	0.0	16.0%	0.32	0.00		
Linseed meal	0.4	0.0	0.0	0.5	0.5	0.4	34.0%	0.15	0.15		
Other oilseed meals	0.2	0.1	0.0	0.2	0.2	0.1	37.0%	0.07	0.05		
OTHERS CO-PRODUCTS	36.3	4.6	1.2	39.7	35.7	32.9		5.2	4.8	*91%*	*6%*
(excluding on-farm use)											
Starch industry's medium protein products (15%-30%)	4.2	0.6	0.4	4.4	4.2	3.7	19.0%	0.80	0.70		
Starch industry's super protein products (60%-90%)	0.7	0.0	0.0	0.7	0.7	0.7	73.0%	0.51	0.51		
Distillers' Dried Grains with Solubles (DDGS)	3.9	0.9	0.3	4.5	4.5	3.6	30% wheat 27% maize	1.33	1.09		
Wet Distillers' Grain	6.9			6.9	6.9	6.9	5.4%	0.37	0.37		
Wheat bran	8.4	0.0	0.2	8.2	8.2	8.2	15.5%	1.28	1.28		
Citrus pulp	0.0	0.3	0.0	0.2	0.2	0.0	7.5%	0.0	0.0		
Beet pulp pellets	8.1	1.1	0.2	9.0	9.0	7.9	7.9%	0.71	0.62		
Molasses	4.1	1.8	0.1	5.7	1.8	1.8	10.7% beet 4.2% cane	0.20	0.20		
NON-PLANT SOURCES					**9.1**	**9.1**		**2.52**	**2.49**	**99%**	***3%***
(excluding on-farm use)											
Fish meal	0.4	0.2	0.1	0.5	0.5	0.4	65.0%	0.32	0.29		
Whey powder	1.9	0.1	0.7	1.3	0.9	0.9	12.5%	0.11	0.11		
Skimmed milk powder	1.6	0.0	0.8	0.9	0.2	0.2	34.0%	0.05	0.05		
Processed animal proteins				3.1	2.6	2.6	60.0%	1.56	1.56		
Former foodstuff					5.0	5.0	9.5%	0.48	0.48		
ROUGHAGE					***1,351***	***1,351***		***38***	***38***	***100%***	***45%***
Grass	*1,025*			*1,025*	*1,025*	*1,025*	*2.5%*	*26*	*26*		
Silage maize	*267*			*267*	*267*	*267*	*2.9%*	*8*	*8*		
Fodder legumes	*57*			*57*	*57*	*57*	*7.2%*	*4*	*4*		
Dried fodder	*3.4*	*0.0*	*1.5*	*1.9*	*1.9*	*1.9*	*17.0%*	*0.32*	*0.32*		
TOTAL								**85**	**67**	**79%**	
Legenda											
Low-Pro: Less than 15% protein content								56.56	54.68	97%	
Medium-Pro: 15-30% protein content								4.90	4.24	86%	
High-Pro: 30-50% protein content								20.89	6.07	29%	
Super-Pro: Over 50% protein content								2.58	2.36	92%	

PEF CR

At the EU level, a common methodology has been prepared in the feed area, which is described in FEFAC's PEFCR Feed for Food Producing Animals

[PEFCR Feed for Food Producing Animals]



FEFAC's arbejde med Feed PEFCR (**P**roduct **E**nvironmental **F**ootprint **C**ategory **R**ules)

Efterspørgslen efter transparente og konsistente metoder og værktøjer er på EU-niveau forsøgt imødekommet i forhold til foder.

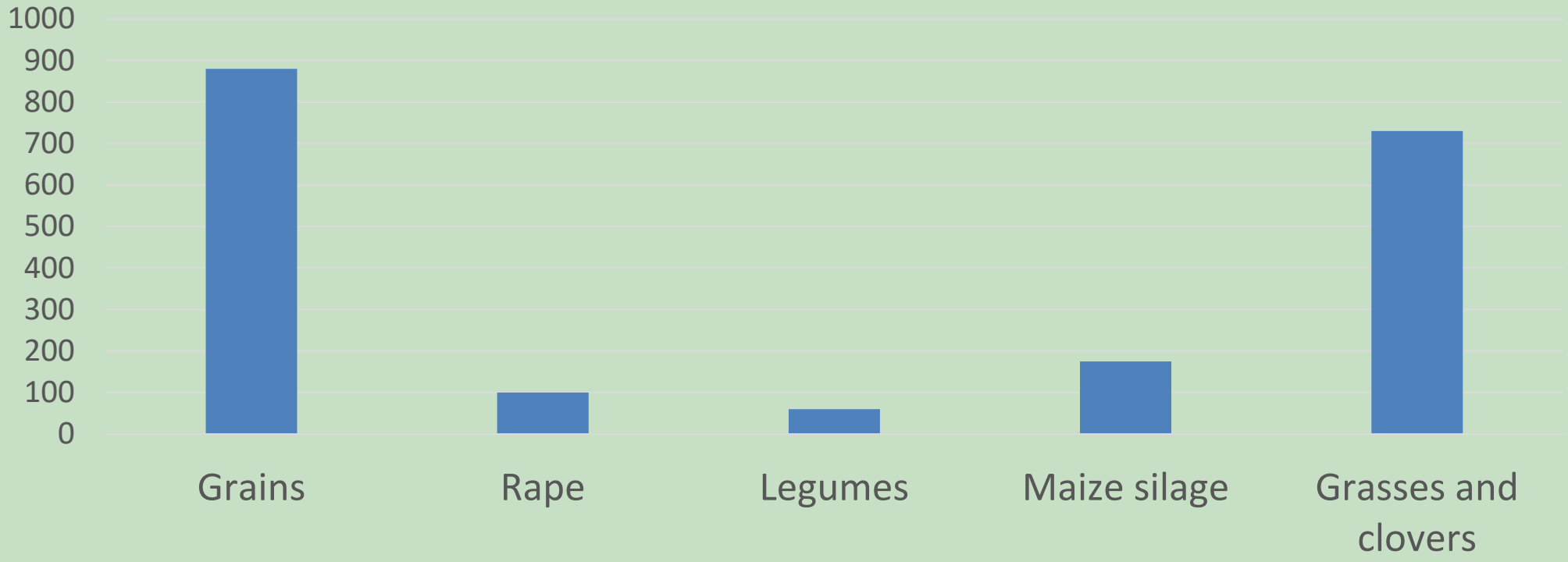
Her er der særligt blevet arbejdet i regi af Feed PEFCR, som påbegyndte pilotprojekter i 2013/2014. Arbejdet her tager også udgangspunkt i metoden brugt i andre LCA-analyser med en "vugge-til-grav"-tilgang med foder i fokus.

"Vugge-til-grav" tilgangen betyder, at man forsøger at medtage samtlige påvirkninger som foderet vil have i hele værdikæden.

Danish protein supply today

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:



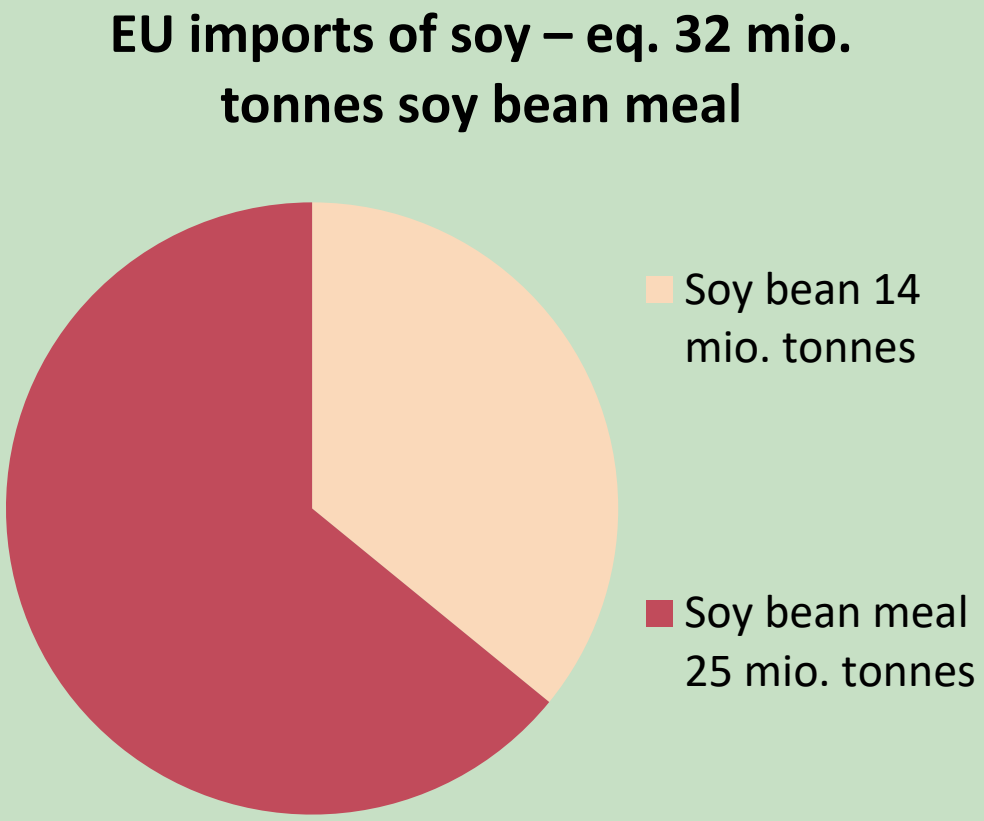
Protein challenge for the organic sector in Denmark

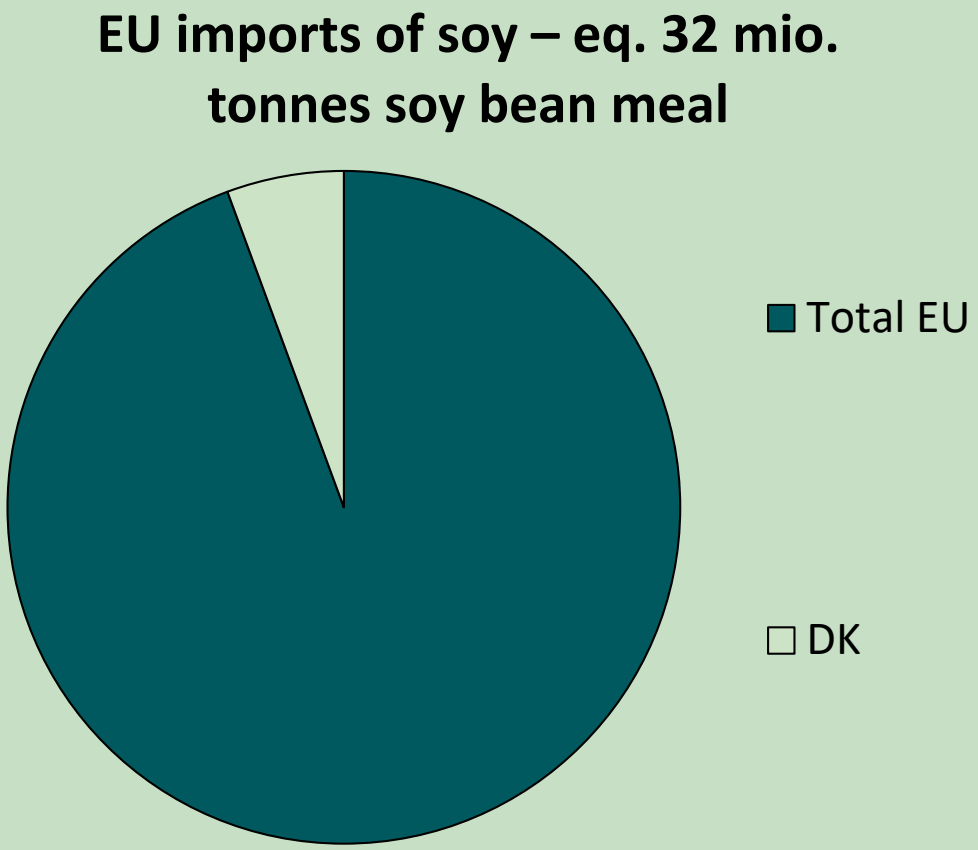
Total import value of organic feed and cereals is more than 100 million Euro in 2017.

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





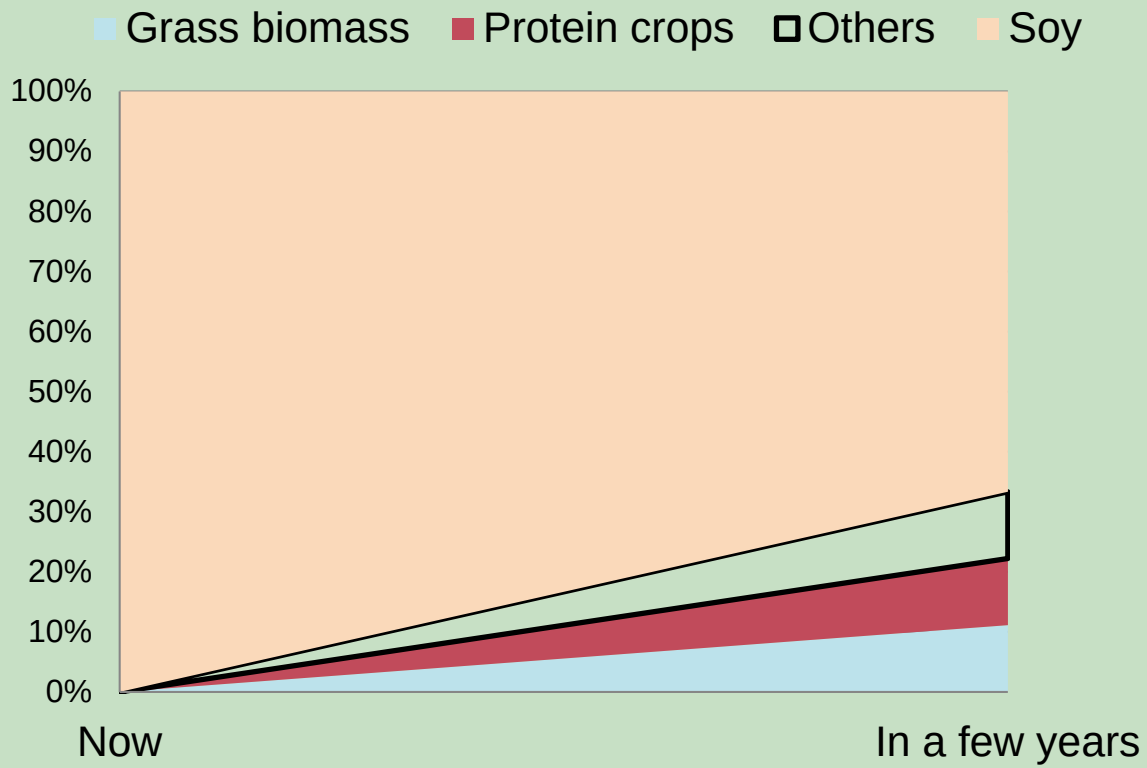
DK Bioeconomy panel: “1/3 of DK protein import could be replaced within a few years”

1/3 of the soy import

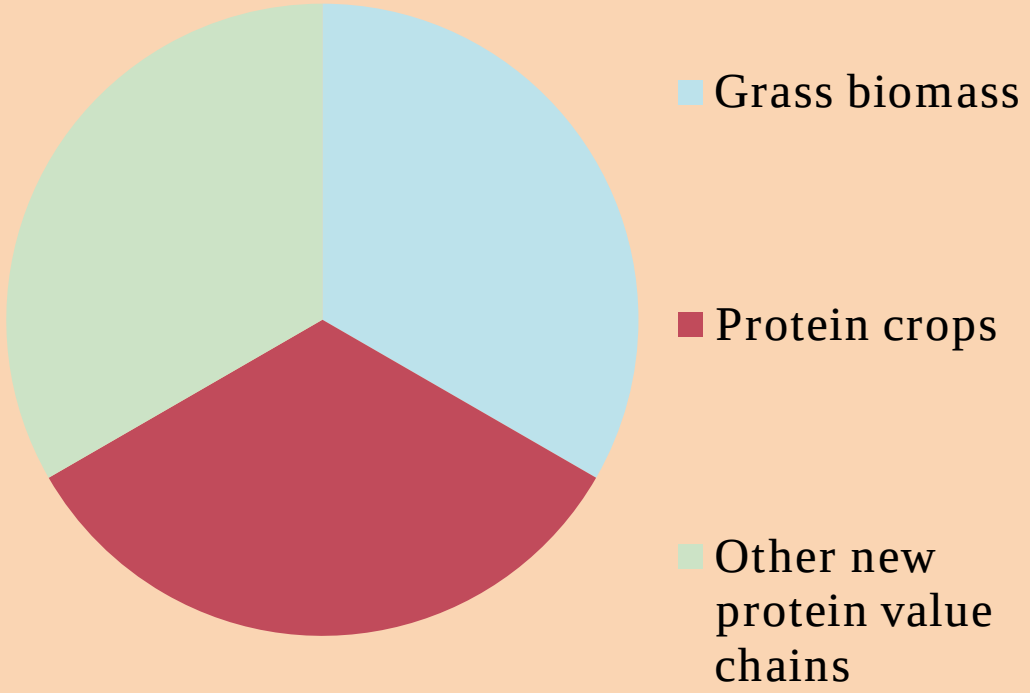
1,8 mio. tonnes soy total import = 0,85 mio. tonnes protein

1/3 equal to app. 0,3 mio. tonnes protein

How?



Three development tracks



Track 1

Perennial grasses/clovers – an efficient utilisation of arable land

Track 2

New faba bean varieties for Danish production of protein

Case Bioraf AU Foulum

Miljø- og Fødevareministeriet
Miljøstyrelsen

Luft & Støj | Erhverv | Kemi | Affald & Jord

irksomhed › Grønt Udviklings- og Demonstrationsprogram (GUDP) › GUDP projekter › 2017 projekter › kning i grøn biomasse / GRØNBIORAF

Bioraffinering skal revolutionere anvendelsen af græs og sikre selvforsyning i landbruget

Fakta

Projekttitel:

Dansk demoskala teknologiplatform for forskning i grøn biomasse / GRØNBIORAF

Projektdeltagere:

Aarhus Universitet
Engineering, Københavns Universitet, Agro Business Park

Projektperiode:

01.01.2018 – 31.12.2021

Bevilget beløb:

8.000.000 kr.

AARHUS UNIVERSITET | English | Find

CBIO Aarhus Universitets Center for Cirkulær Bioøkonomi

Om CBIO | Forskningsområder | Faciliteter | Samarbejde | Aktuelt | Kontakt

AU › Om AU › Forskningsområder › Bioraffinering, konvertering og recirkulering

Forskningsområder

- Dyrkning og håndtering af grøn biomasse
- Dyrkning og håndtering af marin biomasse
- Bioraffinering, konvertering og recirkulering
- Biobaserede materialer og bio-olier
- Fodermidler og biprodukter
- Fødevarer og ingredienser
- Samfund, bæredygtighed og økonomi

Bioraffinering, konvertering og recirkulering

En ting er at udvikle de teoretiske modeller for udnyttelse af grønne og marine biomasser i en cirkulær bioøkonomi; noget andet er at føre dem ud i livet – og vel at mærke på et industrielt niveau.

På forskningsområdet "Bioraffinering, konvertering og recirkulering" udvikler vi nye teknologier og komplette raffineringsanlæg i pilotskala. Anlæggene er således fra start udviklet med fokus på at kunne skalere driftsresultaterne til et kommercielt og dermed konkurrencedygtigt plan.

Kontakt

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Case 1

Grønt Udviklings- og Demonstrationsprogram (GUDP)

Indkaldelse af ansøgninger til fremme af grøn bioraffinering

Case 2 – Faba beans

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

CROP INNOVATION DENMARK
- from genes to seeds

The feed- and plant breeding industry's work with new proteins

New proteins – Need to compete against soy on quality and price.
Several possible pathways (recommendations from Bio Economy panel – DPI):

- Faba beans: "Nordfab protein for the Northern Hemisphere"
- Green protein (Grasses, clover, alfalfa and other protein crops) – Logistics are a crucial parameter
- Innovative industry – From research to end product.
- Broad collaborations through the entire value chain – focus on sustainability/quality/competitivity of proteins.
-

CROP INNOVATION DENMARK
- from genes to seeds

Track 3

Other new protein value chains; eg. Starfish, mussels, insects and seaweed

Case - Starfish

Af Mads Blenker - 16. dec. 2017 KL. 13:15

Vestjysk Andel har planer om at åbne en fabrik til produktion af søstjernemel. Foto: Colourbox.

Vestjyllands Andel har planer om at åbne en ny fabrik i Skive, som skal producere søstjernemel.

Søstjernerne i Limfjorden skal snart bruges til dyrefoder, hvis det står til Vestjysk Andel, der har planer om at åbne en ny fabrik i Skive, der skal producere søstjernemel. Det skriver Skive Folkeblad.

Søstjerne skal bruges til at sikre en stabil proteinforsyning til særligt økologiske landbrug, og Vestjysk Andel har kig på to mulige lokationer til den nye fabrik. Det er planen, at fabrikken kommer til at koste 15 millioner kroner.

- Det er jo et innovativt projekt, så vi kommer til at bevæge os ud på nogle brædder, hvor ingen har gået før. I det perspektiv er det stort, det vi har gang i, siger Steen Bitsch, der er administrerende direktør i Vestjysk Andel, til Skive Folkeblad og fortsætter:

- Så kan man diskutere om det også er en stor investering rent økonomisk, men 15 millioner

Del artiklen:

TIP OS, HVIS DU HAR EN GOD HISTORIE

KLIK HER

Bunning Gigant tallerkenspreder op til 30m spredebredde

RELATEREDE ARTIKLER

11. maj Vestjyllands Andel dyrker fremtidens topsorter på Mors

5. sep Korn bliver en mangelvare for

DTU Aqua

DTU

FORSKNING | RÅDGIVNING | UDDANNELSE | INNOVATION | OM OS | NYHEDER

Forside › Nyheder › Fra plage til ressource: Søstjerner...

‹ Tilbage

RELATEREDE NYHEDER

17. juni 2019
Undervandsrobot kan tælle søstjerner...

13. juni 2019
Økologisk, lækkert og dansk - men...

13. juni 2019
DTU Aqua i arrangementer på Folkemødet...

23. maj 2019
Parasitter spænder ben for økologisk...

Vis flere ›

Fra plage til ressource: Søstjerner bliver til dyrefoder

Miljø- og Fødevareministeriet
Miljøstyrelsen

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Du er her: › Forside › Service › Nyheder › Nyhedsarkiv › 2019 › mar › Ny fabrik forvandler søstjerner til grisefoder

- Nyheder
- Nyhedsabonnement
- Nyhedsarkiv
- Pressemeddelelser
- Sociale medier

Ny fabrik forvandler søstjerner til grisefoder

29-03-2019
GUDP

Støtte fra det grønne demonstrations- og udviklingsprogram GUDP har banet vejen for verdens første søstjernefabrik, som indvies af finansminister Kristian Jensen fredag den 29. marts. Fabrikken forvandler en irriterende plage for fiskerne til et godt proteinfoder til økologiske svin.

Abonnér

Få Miljøstyrelsens nyheder direkte i din mailboks

Tweets af @Miljøstyrelsen

Miljøstyrelsen Retweetede

Miljø & Fødevaremin. @MFVMin

Der er kommet markant færre gamle, usendo dieselbiler på de danske veje siden skrotpræmien for gamle dieselbiler i februar blev foreget fra 2.200 til 5.000 kr.

Se hvordan du scorer forhøjet skrotpræmie 👉 bit.ly/2vGAgPv
#dkgreen #dkpol #miljø

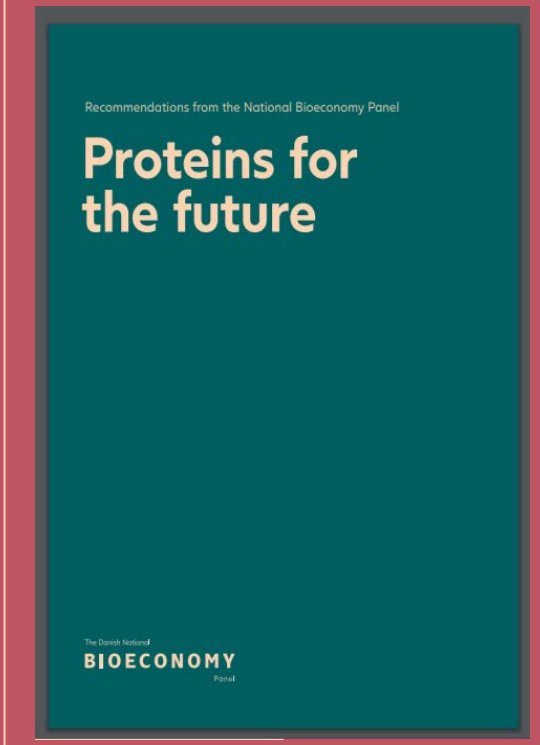
10.000 ældre dieselbiler skrottet

Danish protein supply in the future

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

** = Technology Readiness Level*

Developments



Dansk Protein Innovation

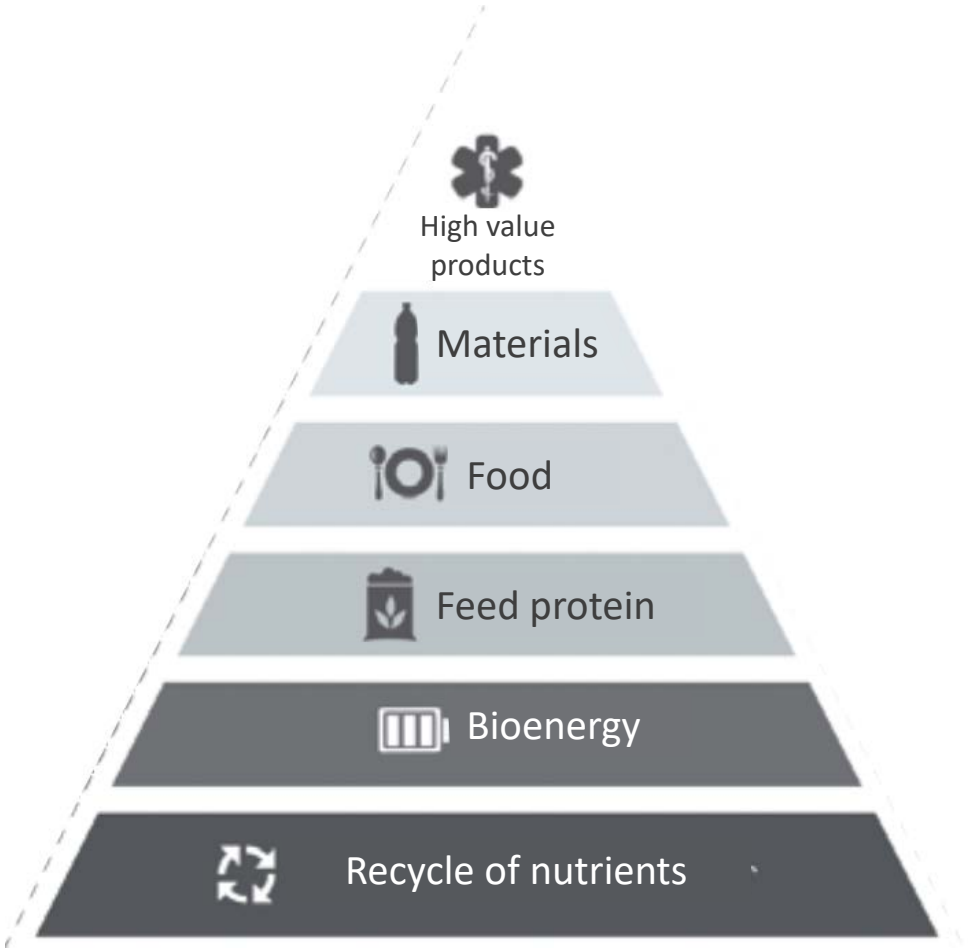
Strategy
May 2019

”Enhanced effort for more sustainable production of Danish protein”

DPI’s vision

DPI's vision in the short term is to create the framework that makes it possible to increase domestic production of sustainable protein to feed.

DPI's vision in the longer term is to create the framework for the full potential of the biomass to also be used for the sustainable production of protein for food and other high value products.



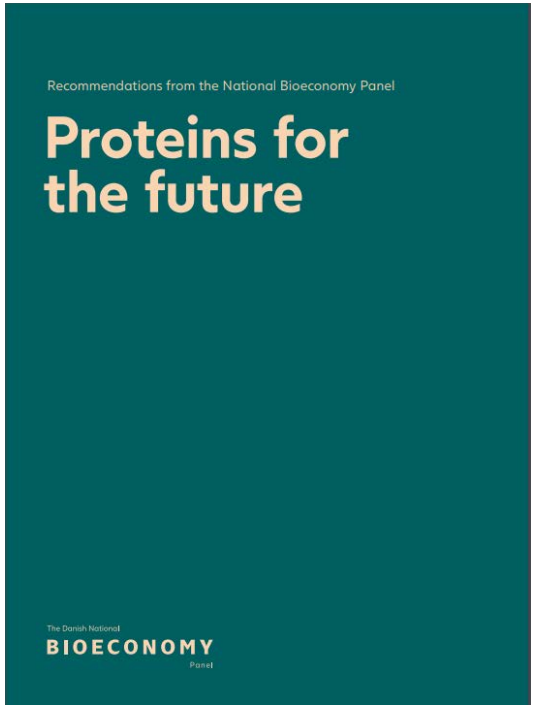
First goal

DPI is working to create the framework that can fulfill the objective of the Bioeconomy panel's report ‘Proteins for the future’.

Specific goals

Up to one-third of Denmark's import of protein for feed has been replaced with feed protein based on Danish protein sources within a few years. Danish produced protein sources must be economically and environmentally sustainable, and the functionality of the products at least as good as existing products.

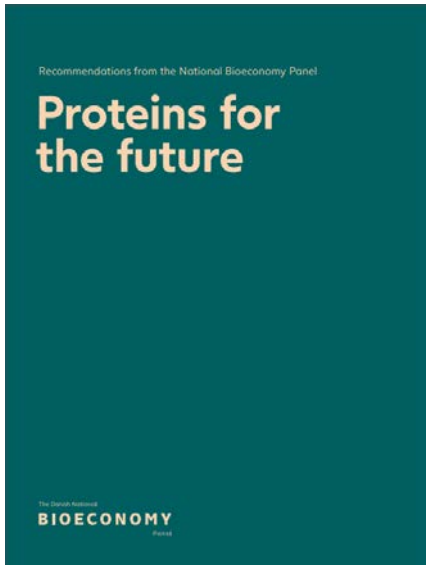
Source: Recommendations from the Bioeconomy Panel 'Proteins for the Future'



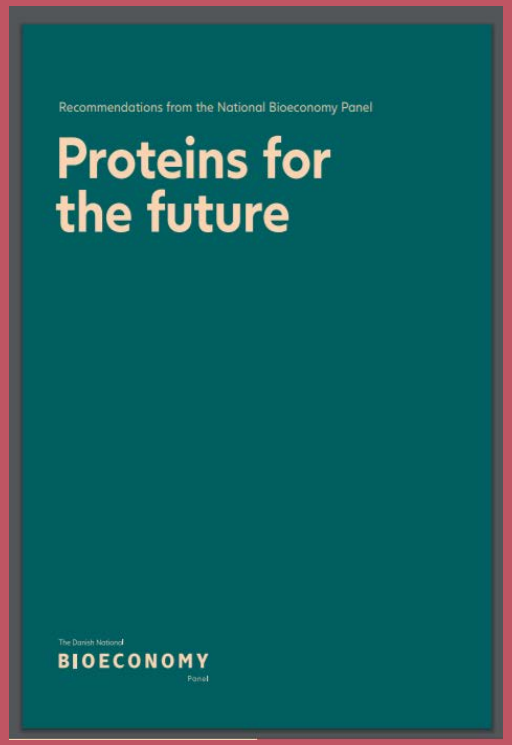
DPI must accelerate… ..

Everyone points to more research and coordination if we are to meet increased demand for new proteins and at the same time meet demands for climate and the environmental change.

Universities, private research institutions, companies and public bodies are fortunately already started.



Thank you


Recommendations from the National Bioeconomy Panel
Proteins for the future
The Danish National
BIOECONOMY
Panel