

# Food & Bio Cluster Denmark

## Pro-Enrich

A flexible biorefining approach to agricultural residues



*"This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 818312"*



# About Food & Bio Cluster Denmark

## National cluster organisation

Appointed by the Danish government to support innovation and growth in the food and bioresources cluster - from primary production to food to value creation from organic side streams.

## Membership organisation

300 members and counting (incl. foreign companies).



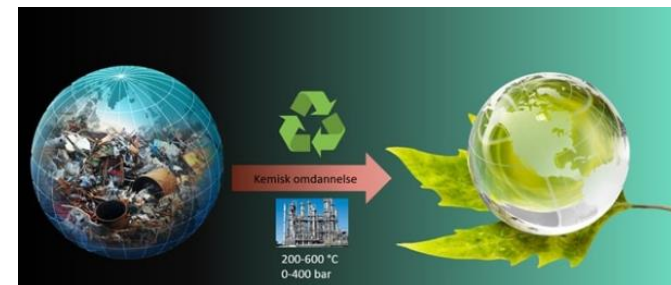
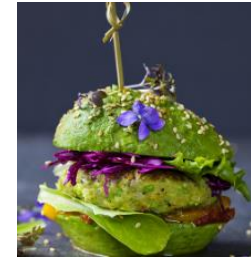
# About Food & Bio Cluster Denmark

## Our work

- Innovation projects
- Help companies access scientific knowledge, find partners and develop their business

## Focus areas

- Making primary production more sustainable
- Developing healthy and climate friendly foods
- Optimizing the use of agri/food side streams
- Utilising new bio-resources



# Main barriers for biorefinery

- Existing processing technologies can be costly and have significant environmental and safety impacts
- Residue streams are often undervalued and go to waste rather than being processed and used optimally
- New and innovative methods are often not taken beyond lab scale due to concerns over their market uptake and sustainability
- Products extracted from residue streams are mostly used in low-value applications such as feed and fertiliser
- Goal in Pro-Enrich: To produce various products of higher value!



# The Pro-Enrich ambition & partnership

- To develop and demonstrate a new system capable of utilizing a range of varied materials in a resource-, time- and cost-efficient manner
- This system adaptability will allow the use of different feedstocks, depending on supply, location and seasonality
- The output will be a wide range of functional proteins, polyphenols, dietary fibres and pigments

 <p>Anecoop Spain <a href="http://www.anecoop.com">www.anecoop.com</a></p>	 <p>Tailorzyme Denmark <a href="http://www.tailorzyme.com">www.tailorzyme.com</a></p>	 <p>Food &amp; Bio Cluster Denmark Denmark <a href="http://www.foodbiocluster.dk">www.foodbiocluster.dk</a></p>	 <p>Emmelev Denmark <a href="http://www.emmelev.dk">www.emmelev.dk</a></p>	 <p>Danish Technological Institute Denmark <a href="http://www.dti.dk">www.dti.dk</a></p>	 <p>PRIFYSGOL BANGOR UNIVERSITY Bangor University United Kingdom <a href="http://www.bc.bangor.ac.uk">www.bc.bangor.ac.uk</a></p>	 <p>Innorenw Slovenia <a href="http://www.innorenw.eu">www.innorenw.eu</a></p>	 <p>GEA Germany <a href="http://www.gea.com/en">www.gea.com/en</a></p>
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# Input/output

- Development of novel functional proteins and bioactive ingredients from residues from food production – e.g. phenolic compounds which have anti-oxidant, anti-inflammatory properties.
- Feedstocks:
  - Rapeseed
  - Olive
  - Tomato
  - Citrus fruit
- Applications:
  - Food
  - Pet food
  - Cosmetics
  - Dietary supplements
  - Adhesives



# Pet food – another protein challenge

- Pet ownership is on the rise globally.
- The global market for pet food will reach \$128.4 trillion by 2024 with a CAGR of 4.5 percent between 2019 and 2024.
- Pet food accounts for 25% of greenhouse gas emissions from global meat production.
- Pet food protein is a slightly overlooked issue in the media.
- Pro-Enrich partner Mars Inc. participates in the project to reduce climate impact.



## Climate-friendly pets with protein from rapeseed

15.05.2020 We love our pets. They are part of our family, a source of love and joy, and, for many, furry life companions that reduce loneliness. In a time where the covid-19 pandemic keeps more people than ever sitting alone in their homes, the company of our furry friends have never been more important.

[Read more...](#)



# Mars Inc. pet food brands





# Rapeseed facts & potential

- Rapeseed (or canola) is a major crop worldwide
- Third most abundantly cultivated vegetable oil source worldwide (93.5 million tons processed in 2017)
- Cold-pressed rapeseed oil has lots of health benefits that equal those of olive oil
  - High in monounsaturated fats
  - Contains polyunsaturated omega 3
  - Contains phytosterols that reduce the absorption of cholesterol into the body
- Has had a mixed reputation
  - Hexane extraction (hot pressed)
  - Erucic acid which is a monounsaturated omega-9 fatty acid
- The by-product is rapeseed meal - widely used in feed (35-40% high quality protein)
- Heat exposure makes extraction of the protein difficult + anti-nutritional compounds has widely prevented its use as a soy protein replacement so far
- Cold-pressed rapeseed meal retains its proteins in a non-denatured state with its natural functionalities
- Potentially technically and economically attractive to remove problematic, but valuable, low-level glucosinolate and phytate components



# Rapeseed production in Scotland

- In 2018 rapeseed accounted for 5% of the total crop production (126,300t) and 7% of the total crop area (32,700 ha)
- The majority of rapeseed is the winter variety and mainly used for biofuels (biodiesel/FAME)
- A small amount is processed in Scotland for cold pressed cooking oil
- In 2013 The Scottish Rapeseed Oil Group was formed with the aim to undertake research projects together about the versatile crop and gather evidence of the health benefits. The group consists of six producers of cold-pressed rapeseed oil from all corners of Scotland

Sources:

<https://www.gov.scot/publications/cereal-oilseed-rape-harvest-2018-final-estimates/pages/7/>

<http://www.scotrapeseedoil.co.uk/producers>

<https://www.dst.dk/Site/Dst/Udgivelser/nyt/GetPdf.aspx?cid=30117>



# Rapeseed results in Pro-Enrich

- Hot pressed and cold pressed rapeseed meal (HPR/CPR) from cooking oil and biodiesel production has been biorefined at Danish Technological Institute and Bangor University pilot facilities in close collaboration with enzyme experts from Tailorzyme and processing and technology experts from GEA
- Protein concentrate (>70 % purity) and protein isolate (>90% purity) has been produced using different process methods
- Results so far indicate that cold-pressed meal gives the highest protein yield and



# Best CPR results so far

92% protein  
<0.3% fat



- High purity, but low recovery – process optimization still necessary
- The protein products produced are continuously evaluated by Mars for pet food application, by Tate and Lyle as a food ingredient, and by CHIMAR as adhesives for the production of wood-based panels (plywood)
- Future activities: the biorefining process will be further optimized based on feedback from Mars, Tate and Lyle and CHIMAR regarding nutritional value, functionality, taste, smell, and performance of the protein modified adhesives, respectively



# Other FBCD projects

- **ValueWaste:** Proposes integrative system for urban biowaste valorisation into food, feed and biobased fertiliser ([www.valuewaste.eu](http://www.valuewaste.eu)).
- **GO-GRASS:** Development of a set of small-scale bio-based solutions to unlock potential of grassland and create new business opportunities for rural areas ([www.go-grass.eu](http://www.go-grass.eu)).
- **SalFar:** Development of alternative farming methods under saline conditions and creating new business opportunities for farmers, food producers, and entrepreneurs (<https://northsearegion.eu/salfar/>) .

FBCD is a member of BIC



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# Thank you for your attention!

For more information about the Pro-Enrich project please visit

<https://www.pro-enrich.eu/>

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