



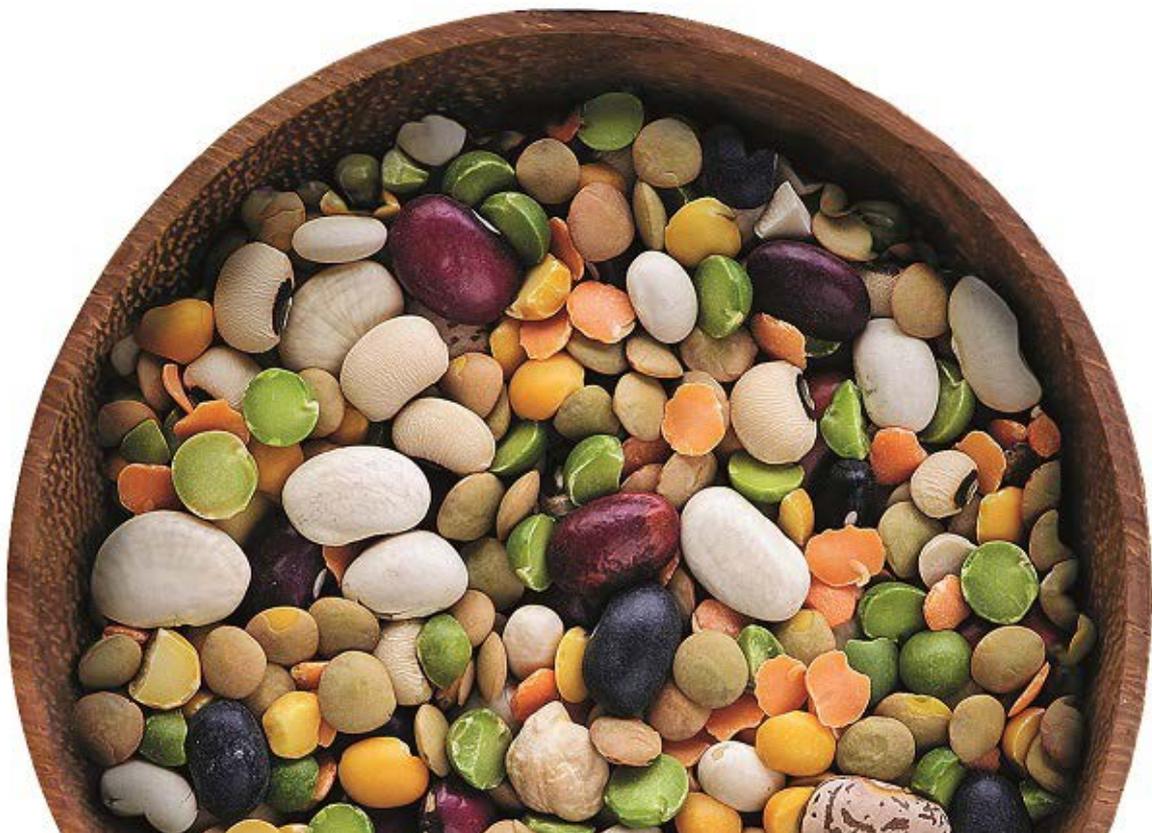
TRansition paths to sUustainable
legume-based systems in Europe

Legume Innovation Network (LIN) 2nd workshop of the Atlantic-Boreal Region

Workshop title:

Enabling Legume Processing: opportunities and barriers

***Tuesday 7th May 2019, Hotel Sinatur, Nyborg, Denmark
hosted by IFAU and Organic Denmark***



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1. Executive Summary

The 2nd Legume Innovation and Network (LIN) workshop for the Atlantic-Boreal Region entitled “*Enabling Legume Processing: opportunities and barriers*”, took place Tuesday 7th May 2019 at Hotel Sinatur, Nyborg, Denmark. It was hosted by Karen Hamann from the Institute for Food Studies & Agro Industrial Development Aps (IFAU) in collaboration with the association, Organic Denmark.

The main objectives of the workshop were to allow participants to **benefit from the insight, research and experiences** of the TRUE Project-partners and stakeholders from the whole legume value chain and to **explore innovative practices of legume processing**. The workshop convened 54 participants including TRUE members, whose interests spanned the whole legume-based value chain. The programme featured nine oral presentations and a fieldtrip to a local food factory. Discussions and dialogue among the participants were facilitated through three break-out sessions and a display of nine posters.

The overall **emphasis was on the development of solutions** to address the challenges of increasing legume production and consumption in the EU, that have been identified and discussed in the previous workshops, especially in relation to **processing**. Thus, the **speakers** touched upon several results from the ongoing innovation and general trends. Among the information communicated, it was found that processing by smaller operators (SMEs) can be fulfilled, since facilities and machines to process small quantities (from one tonne) are currently available. In addition, there are promising opportunities in biorefining legumes. For example, using existing technologies such as brewing and distilling, which can deliver important potential for co-products, for example in fish feed to replace ingredients which would otherwise have been produced from the marine food-system. Similarly, there are positive results from exploring biorefined clover-grass as a protein source for feed of poultry and pigs, and the production of other promising by-products, *i.e.* in biogas production. The consumer trends for healthier and more ethical lifestyles and consumption patterns are also pushing demand for pulses and for new legume-based food and drink products.

The **focus of the discussions** in the first break-out session were on **six policy pathways** to foster increased production and consumption of legumes, these included: 1, knowledge transfer; 2, public-private partnerships; 3, improved financial incentives; 4, certification and labelling; 5, integration of health and nutrition aspects; and 6, agro-ecological approaches. During the second round of discussion, the main themes were **vulnerability and resilience of legume-based supply chains**.

The **lack of knowledge** of the benefits of legumes was raised as a main issue to be addressed, both among farmers, producers, outlets and consumers as well as decision makers and cooks *etc.* Developing and implementing a **Life Cycle Analyses (LCA) label** was considered as an important way forward, as illustrated here by the comparative analysis of pasta made from chickpeas compared to wheat.

2. Introduction

2.1 Background & objectives

TRUE is funded by the European Commission's Horizon 2020 Programme over four years until March 2021. The project explores strategies to reduce the EU's dependency on imported protein food (soybean) and synthetic nitrogen (N) fertilisers. In this context, TRUE aims to identify the best routes, or "transition paths" to increase sustainable legume cultivation and consumption across Europe and includes the entire legume feed and food value chains. During the project, **Legume Innovation and Network (LIN) workshops** are organised to involve relevant stakeholders in a multi-actor approach. The workshops take place in three geographical regions within different pedo-climatic conditions: Atlantic, Continental and Mediterranean. In 2020, a final common European Workshop to build a European Legume Innovation Network will also be organised. The workshops are intended to help:

- share legume-focused activities with other **networks and actors**;
- exchange insights from **legume-based innovations**;
- collate **challenges and needs** regarding legumes across the entire value chain;
- gather stakeholder assessments on **legume markets and policies**; and,
- identify key leverage points for **improving framework** conditions for legume-based food- and feed-chains.

2.2 Workshop framework, participants and methodology

The second Legume Innovation Network (LIN) workshop for the Atlantic-Boreal region took place in Nyborg, Denmark on Tuesday 7th May 2019. The workshop was hosted by IFAU (Institute for Food Studies & Agro Industrial Development Aps) and organised in collaboration with Organic Denmark. The workshop brought together more than 50 TRUE members and stakeholders from across mainly Northern Europe, whose interests spanned the legume-based value chain. The main motivation for attending the workshop was to profit from the insight, research and experience of our collective experience, with a special focus on exploring in detail innovative practices for legume processing.





3. Presentations and Posters

The pdf files of all the presentations (including some videos) and posters have been uploaded to the TRUE website [here](#).

3.1 Presentation summary

The main solutions and challenges to increasing legumes in the European food and feed supply chains and markets identified in the presentations are summarised below.

Solutions

- Good opportunities for using legumes for brewing and the production of spirits.
- Considerable potential for using legumes in fish feed to replace marine ingredients.
- Positive results of testing the use of organic clover grass protein in feed for poultry and pigs.
- Positive potential to enhance environmental impact and human health when replacing wheat pasta with chickpea pasta.
- The consumer trends of “healthy-” and “ethical-living” are pushing demand for pulses and processed food and drink made with pulses.
- Facilities and machines to process small quantities of legumes (from one tonne) are available.
- Using crowd-funding can enable innovative projects.
- Possibility to develop new products and new flavours to create a market.
- Promising potential in exploring by-products, *i.e.* in biogas production.

Challenges

- Increased consumption leads to increased imports of legumes.
- Production of organic faba beans and soybeans is not meeting demand in the EU.
- Production of clover grass protein is only profitable within an organic production system.
- Increased cultivation of legumes is hampered by lack of knowledge among farmers regarding their agro-ecological benefits.
- Increasing consumption of legume-based foods needs a huge marketing and awareness raising effort.

3.2 Presentations abstracts

3.2.1) Presentation of the TRUE-Project

Pete Iannetta, TRUE-Project coordinator, James Hutton Institute, UK

Europe already has legume supported agri-food systems, but it **forfeits the agronomic benefits**, as the legumes we use are imported. That is, overall they are not grown in Europe. Unsustainable consumption (feed and food) presents a puzzle of negative impacts to resolve.

Legumes have several positive qualities, and cultivation and the use of legumes for food and feed can contribute to **solving a range of environmental- and human-health issues**. Legumes are high protein, high carbohydrate, low GI (resistant) starches, a good source of essential minerals, gift N to non-legumes and improve soil qualities, liberate soil phosphorous, can be biocontrol agents and support pollinators / beneficial insects. Of major importance is that legumes acquire their N from air *via* a natural process and therefore need no synthetic N fertiliser. Legumes help **encourage ‘natural N cycling’** and can prevent nitrate pollution in groundwater - “the nitrate time-bomb” – if the legume crop is well managed.



We need to enhance the pull factor of increasing demand for sustainable products, and to emphasize new norms such as LCA of products, focusing on the total impact on the environment.

The recent output of the TRUE project is several peer-reviewed papers published by partners and open access deliverables. All are available [online](#).

3.2.2) Using legumes for production of alcoholic drinks

Kirsty Black, Master Distiller, Arbikie Distillery, Scotland

All raw materials used for the Arbikie Distillery are grown at the farm of Arbikie, thus taking full advantage of the previously listed benefits of cultivating legumes. At present, Kirsty Black is **making gin, vodka and beer from faba beans**. The latter in partnership with **Barney's Beer** (Edinburgh, UK - www.barneysbeer.co.uk).

There are over a hundred types of vodka in the UK. 75% are made from grain. Beer is mainly produced from grain. The main reasons for the choices of raw materials are availability and a high content of starch. **Legumes are very rarely used for distilling or brewing alcohol but hold unexploited potential.**



In Australia and Canada, there are beers brewed with red lentils. **Barney's bean beer** is made of **30% faba bean kernels** and 70% barley. **The BLKEYE vodka is made with faba beans**. The whole value chain needs to be considered when assessing the profitability of brewing with pulses. For example, the content of starch in peas is only slightly smaller than in barley, whereas peas are much cheaper and the by-product (pot-ale) of distilling 100% pulses has a much higher protein content. **Arbikie is currently using such pot-ale as fertiliser and/or animal feed**. Though tests on protein concentrate isolated from distilled pulse pot-ale are being valorised as a penitential human food source.

3.2.3) Faba beans in fish feed, challenges and opportunities

Bertel Vestergaard, Sourcing Manager, BioMar A/S, Denmark

BioMar produces **high quality feed** for more than 45 fish species and is one of the biggest producers worldwide. 1 out of 5 farmed fish produced in Europe and Chile are fed with BioMar feed and the total production equals 1.2 million tons per year. BioMar has factories in 12 countries. 80% of global aquaculture production takes place in Asia.

Aquaculture is the **fastest growing food producing industry in the world**. So far, inclusion rates of up to 10 % faba beans in fish feed formulations are demonstrated by research and practice. The industry has been forced by regulations to produce feed that entails almost no waste, which resulted in the feed being very efficient. In the period 1995-2016, BioMar has **reduced the use of marine ingredients by approximately 60%**. The consumption of faba beans in BioMar's Danish factory has more than doubled from 2015-2019.



BioMar has the ambition to **lower its carbon footprint** and decided to stop using soya from Brazil due to its environmental impact on the rainforest. A SWOT analysis on the use of faba beans for fish feed shows that one of the main challenges is availability, as not enough pulses are being produced in Denmark. Among the opportunities and strengths are that pulses have a low carbon footprint; are very easy to store and process; and pulses (faba beans) are highly digestible for the fish.

3.2.4) Policies to support legume-based systems

*Eszter Kelemen (in collaboration with **Bálint Balázs**), ESSRG, Hungary.*

The dependency of the EU on legumes for feed and the fact that the **EU is not self-sufficient in grain legumes** constitutes a paradox. The top ten components of this paradox are:

1. EU's dependency on non-taxable soybean imports;
2. supporting policies for legume-based food production failed to increase legume-based diets with a very limited impact on demand as an outcome;
3. policy innovations like banning (or taxing) synthetic N fertilizer could help transition towards more home-grown legumes;
4. existing legume-friendly policies are oriented towards industrialised livestock production;
5. agricultural policies in the EU work differently between member-countries;
6. despite research and innovation regarding legumes, a lack of knowledge transfer is a common problem;
7. protein-production helped by policies is dominated by soybean;
8. consumer policies focus on health and nutrition and not legumes;
9. governance solutions only rarely have proven effective in increasing home-grown (national) legume consumption; and,
10. a general trend is that **increased consumption leads to increased imports**.



There are **six policy pathways** to consider in order to achieve a transition towards growing and using more legumes in the EU:

1. knowledge transfer;
2. public-private partnerships;
3. improved financial incentives;
4. certification and labelling;
5. integrate health and nutrition aspects; and,
6. focus on agro-ecological approaches.

The most **legitimate narratives** could be that policies aim at:

- increasing the EU's self-sufficiency of plant protein sources;
- improving health and nutrition status of European citizens;
- combating biodiversity loss and climate change; and,
- creating opportunities for knowledge sharing and innovations.

3.2.5) Local products and plant proteins at Sinatur Hotel Storebælt

Jan G. Larsen, CEO of Sinatur Hotel Storebælt, Denmark

As a conference venue, many things can be done to increase the sustainability of the business by emphasising environmental aspects. Sinatur Hotel is part of chain of conference venues in Denmark and the group only uses organic food. The purchase of local food products is high on the agenda as well as the reduction of CO₂ emissions and waste. Sinatur buys directly from local farmers and small-scale producers of selected food products like cheese and organic potatoes. Reducing transport is a key issue and Sinatur Hotel has cut down food and beverage deliveries to only one delivery *per* week from their wholesaler. Having more plant-based items on the menu is considered as essential for the sustainability profile of the Sinatur Hotel. Going one step further, the hotel is now not only focussing on the origin of the supplies (where does it come from?) but also at where they go after use.



The key message was that **sustainability is a holistic concept**, which includes food, energy, crop production, cutting down on waste and emissions, reducing transportation, using sustainable resources e.g. energy from wind farms, and decent working conditions.



Sinatur Hotel Storebælt had prepared a Scandinavian-inspired lunch made with pulses and organic products

3.2.6) More legumes in crop rotations – challenges in Danish organic agriculture

Lars Lambertsen, Senior Advisor, Organic Denmark

Would it be **possible to feed Danish organic pigs with 100% organic feed?** ‘Yes’, but at present an important amount of organic protein feed is imported from China and there is a lack of trust on whether it is truly organic. Therefore, the challenge is to meet the demand by cultivating organic legumes in Denmark to make organic feed protein.

At present, 8.6% of the total area cultivated organically in Denmark is used for legumes crops. If organic farmers follow the recommendation of 7 years of crop rotation, they could potentially cultivate 30,616 ha of legumes. The present production of slaughtered organic pigs in Denmark is 220,000. Each pig needs 227 kg of feed, therefore 54 kg of faba beans could be used to supply the protein. Overall, Danish organic farmers could meet the demand for organic protein for pig feed if the total crop of faba beans was solely to be used for this purpose.

Almost all Danish organic farmers have knowledge and experience with legume cultivation. However, the main obstacle preventing some organic farmers from cultivating faba beans is that farmers **need good, moist soil and to be able to use irrigation**. Another issue is that **legumes are poor competitors with weeds**, so legumes are not recommended as a crop for soils with high weed pressure. Compared to other crops, the **price is low**. Mixed crops are difficult to sell because of challenges with feed recipes. Organic farmers who can process and produce their own feed, often have more legumes crops.



3.2.7) Turning organic clover grass into a sustainable source of feed protein

Erik Fog, Senior Advisor, SEGES Organic Innovation, Denmark

SEGES is one of Europe's leading agricultural innovation companies and aims to be a bridge-builder between research and practical farming. A pilot plant for green biorefining has been built at Aarhus University, Foulum, Denmark. Their research on production of proteins from organic clover grass shows that 2,600 kg of protein *per ha* can be produced, which is the same volume of protein as alfalfa and double that of peas. Field beans produces 1500 kg protein *per ha*, and soya-bean 1,050 kg protein *per ha*.



Producing organic feed protein from clover grass can be done by using bio-refining technology. After extracting the protein, the press cake can be used for cattle feed and the juice for biogas production. Some of the benefits of the system are improved N-fixation in the soil; reduced demand for imported organic protein; and use of a sustainable biomass.

Results of feeding trials with organic livestock show that grass protein concentrate can be included in rations for layer hens by up to 12 %; for successful broilers by up to 8 %; and for finisher pigs by up to 15 %. For cows, feeding trials with the press cake (fibres) show that higher milk yields could be gained compared to feeding clover-grass silage.

Feasibility calculations show that the grass protein system is currently only relevant for organic farming due to the low prices of non-organic soya.

3.2.8) Environmental efficiency of human nutrition from chickpea pasta versus durum wheat pasta

Sophie Saget, PhD Student, Trinity College Dublin, Ireland

Sophie Saget presented results of research performed in collaboration with Marcela Porto Costa (Bangor University), Boris Shopov (Clicks Ltd.), under the supervision of Prof. Michael Williams (TCD) and Dr David Styles (Bangor University).



The overall focus of the research is to **assess the environmental footprint of legume-based feed and food** across Europe and to **optimise diets/food choices** for improving health while decreasing the environmental footprint and monetary costs to the consumer. This involves a range of techniques including attributional and consequential LCA, nutrient quality analysis of protein foods using the Nutrient Rich Food Index (NRF) and developing a novel functional unit that considers a balance of essential nutrients. Legumes currently represent 1% of energy intake in Europe.

Comparison between chickpea pasta and wheat pasta shows that **chickpea pasta contains 555% more fibre and 156% more protein, making it 290% more nutrient dense** (measured in Nutrient Density Units, NDU). Cultivation, processing and production of one NDU of chickpea pasta needs substantially less water, land and energy, making the environmental footprint of chickpea pasta much smaller.

The analyses show that **packaging and cultivation are those elements in the production chain for pasta that have the biggest impact on the environment**. In Europe, 3,400 tons of wheat pasta are consumed every year. Replacing some of this consumption with chickpea pasta could reduce the overall environmental footprint of the pasta value chain.

3.2.9) Pulses – Tackling Present and Future Food Trends

Thomas Hoehndorf, Area Sales Manager, Grain Milling at Bühler AG, Sweden

Bühler holds **globally leading market positions in technologies and methods for processing** grain into flour and feed. Its core technologies are in the areas of mechanical and thermal process engineering.

Bühler explained that consumers would set a challenging trends' equation: "The new healthy" + "ethical living" (growing by 44% from 2011-2016) + "snackification" of consumption patterns + dietary diversification among all ethnic groups would lead to new market segments and new consumer demands.



There has been **considerable growth in the consumption of pulses** over the past decade. Several African countries as well as India are the largest consumers. In the Middle East, Africa and Asia, pulses are eaten without much processing, whilst in Europe and the US, the consumers prefer processed high protein products. There is a wide possibility to add value with pulses, *i.e.* vegetable pasta and noodles, meat and dairy analogues, bread, breakfast cereals, protein drinks and snacks.

Processing equipment can also be provided for small producers from one tonne to large quantities.

3.2.10) Funding that makes a difference – the case of COOP Crowdfunding

Nicolai Jaepelt, COOP Crowdfunding, Denmark

COOP (a major Danish retailer) has a turnover of 43 billion DKK and is owned by 1.8 million consumers. The COOP consumer communication app is used to communicate with more than 1 million consumers daily. This makes COOP the biggest marketing player in the food market in Denmark.

The basic idea of crowdfunding is to pool many small economic contributions from people with a common interest in food innovation to fund food innovation projects and entrepreneurs. COOP Crowdfunding (CC) was established to **support the food innovation process from idea to product**. CC wants to connect

people who work with food with people who love food. The biggest challenge for a crowdfunding platform is the **lack of awareness**: One third of people know about crowdfunding, one third has heard about it and one third does not know about it. Another challenge is to identify good projects to be funded from the crowdfunding platform.

In 2017, COOP Crowdfunding funded 21 projects, and 30 projects in 2018. Projects about plant proteins and innovative types of food are currently sought after by COOP Crowdfunding.

One example of a crowdfunded project is the well-known company Skee Is (Skee Ice Cream), who wanted to develop a protein rich ice cream to be prescribed for underweight and undernourished people (especially elderly). The funding was secured in less than half an hour after CC released the project on their website, resulting in the investors becoming ambassadors for the product.

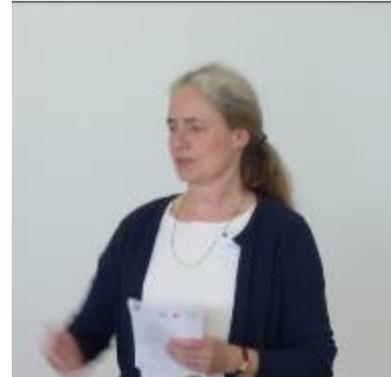


3.2.11) Exploring business cases for legumes, lessons learned so far

Karen Hamann, IFAU, Denmark

The demand for legume-based foods is significant and showing strong growth rates across Europe. Many companies have engaged in the market for legume-based food and drinks, ranging from start-ups to large and well-established companies with strong brands. The presentation provided examples of innovative business cases as described in the report “Deliverable D.4.2: Business Cases”, which is available online [here](#).

Among the newcomers is a British company producing snacks made from peas and building their consumer communication on information about local supply chains. An entrepreneurial company from the Netherlands, The Vegetarian Butcher, started 10 years ago to produce organic vegetables. Later, this company developed into an entrepreneur producing legume-based meat alternatives. Recently the company was acquired by Unilever, which demonstrates how a business rooted in local organic production can be turned into a brand in the portfolio of a multinational food company.



Essential lessons from exploring a wide range of business cases for legume-based food and drinks point to the importance of developing a sustainable supply chain, produce innovative and likeable products, and to be highly conscious about the marketing of the legume-based products. Marketing should be cleverly used to address environmental aspects in some situations and in other situations it is more relevant to promote a short supply chain or the brand.

After the presentation, participants were encouraged to consider what makes a supply chain resilient or vulnerable, and to discuss the strengths and weaknesses of a simplified legume-based supply chain. The discussion is summarised in section 4.5



3.3 Poster abstracts

3.3.1) Enabling legume processing: opportunities and barriers – TRUE

Pietro P.M. Iannetta*, Fanny Tran

*Agricultural Ecologist, EU-TRUE Project Coordinator. The James Hutton Institute, Invergowrie Dundee, Scotland UK. *For correspondence: pete.iannetta@hutton.ac.uk*

Agri-food systems supported by locally grown and -processed legumes offer a sustainable alternative to the damaging environmental, health and socio-economic paradigms which characterise our time. Paradoxically, while European food systems are legume-reliant the many benefits of legumes (such as: the provision of nutritious foods and premium-feeds; encouraging natural N cycling; improved soil qualities; lower greenhouse gas emissions; biodiversity and food-culture provisions) are forfeited, as the legumes are not home-grown or therefore processed, and so are rarely realised as high value local-food products. Nevertheless, consumer-citizens are driving the shift towards greater consumption of legume-based foods, but are they home-grown and -processed? This consumer led demand deserves more support *via* improved policies and good-governance to help develop smaller- or craft-scale supply chain capacities to nurture good-food culture and reconnect producers with consumers.

Acknowledgements: PPMI and FT are supported by the EU-H2020 funded project TRUE (www.true-project.eu), Grant Agreement number 727973. The James Hutton Institute (www.hutton.ac.uk) is supported by the Scottish Government's Strategic Research Programme.

3.3.2) Production of proteins for feed and food from lucerne and clover grass

Mette Lübeck, Peter Stephensen Lübeck

Department of Chemistry and Bioscience, Aalborg University, Denmark.

Production of proteins for feed and food from Lucerne and clover grass in green biorefineries is a suitable solution for local, climate-friendly and sustainable protein production. Lucerne, clovers and clover grasses have numerous advantages for the environment and climate compared with traditional food and feed crops such as cereals and is ideal in crop rotations if they can give enough contribution margin to the farmers. Our results based on more than 10 years of research have shown that harvesting and processing fresh crops into a protein concentrate, a fibre-rich press cake, and a residual stream of soluble nutrients is feasible for a solid business plan. The protein-concentrate has been evaluated in experimental feed formulations for egg-laying hens, broilers and pigs with very promising results. Furthermore, ensiling the fiber-rich press residue and using it as feed for dairy cows can result in a 5-10% increase in milk production compared with a traditional silage. In addition, the solid and liquid residues from protein refining has good biogas potential and the digestate is valuable as a fertilizer. In parallel, we work with refining of food-grade proteins from Lucerne. We have co-founded a start-up company BiomassProtein Aps together with commercial partners. BiomassProtein starts production trials in summer 2019 with the aim of building the first production unit in 2020.

3.3.3 Blue lupin for white shrimp (*Litopenaeus vannamei*) - TRUE CS 15

Monika Weiss, Sinem Zeytin*, Matthew J. Slater

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Formulated feeds used for the growing production of carnivorous fish and crustaceans generally have a high protein content still met mostly by fish meal supply. Maintaining the steady and enormous growth of aquaculture production requires practical alternative protein sources. Terrestrial protein sources have been the focus of feed research for more than twenty years. Many studies test legumes like field peas, lupin and faba bean. Several different cultivars of lupin have been tested with different fish species mainly in Australia. The results of these studies are promising, for example for salmon and seabass. Lupin diets with a relevant replacement level for high value crustaceans are tested in the present study.

An experimental diet (Basis) with 30% fish meal as main protein source was formulated. *Lupinus angustifolius* kernel meal was added as 10, 20 and 30 % of the diet, incrementally replacing fishmeal. All diets were balanced to meet the requirements of *L. vannamei* in the grow out phase, concerning energy content, protein and amino acid profile, lipid and fatty acid composition, vitamins and minerals. These diets were compared with a commercial control.

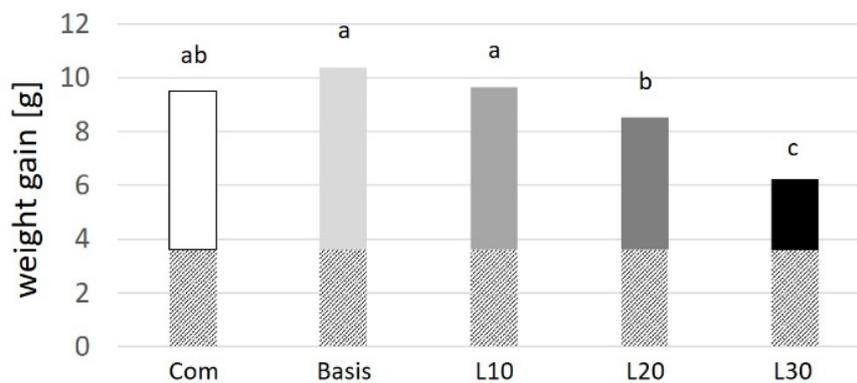


Figure 1: Weight gain of *L. vannamei* within 8 weeks

Feeding experiments were conducted over 8 weeks in a RAS device, with 18 separate 50 l tanks. Mean survival rate of the shrimps was 65% across all treatments. Mean biomass of animals fed with high lupine levels (L30) was significantly lower than in control diets (Basis and Commercial control) and L10 after 8 weeks. Metabolic analyses showed malnutrition of animals fed the L30 diet in terms of glucose and triglyceride levels, although appropriate protein provision was attained with all experimental feeds.

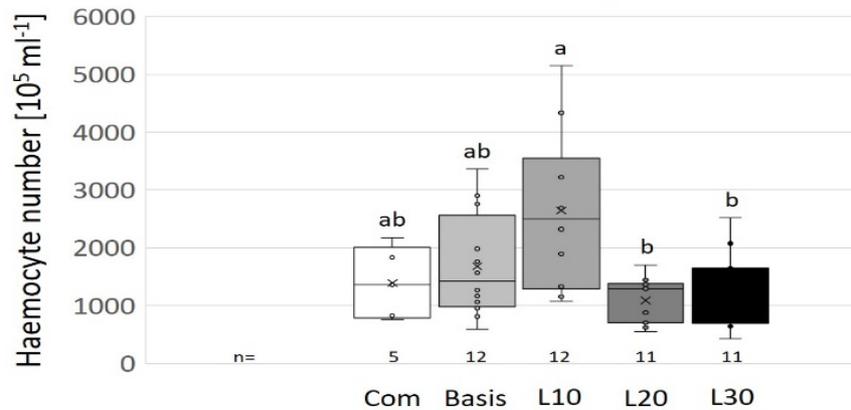


Figure 2: Total haemocyte counts show feed dependent variation

The total haemocyte count showed significantly higher counts in animals fed the L10 diet, which hints at an elevated immune capacity of these animals. This is an intriguing result in terms of immunostimulation in cultured animals and needs further investigation. Untreated lupine meal can be used as an alternative protein source at rates of up to 10% (-20%) of the total feed (= **30-40% of animal protein**).

3.3.4) Market model for legume-based feed for organic pig production - TRUE CS 10

Karen Hamann

Institute for Food Studies (IFAU), Denmark, Karen@ifau.dk

This case study will address the challenges of meeting the increasing demand for organic pork and the constraints experienced herewith. The work focuses on Northern Europe with Denmark as a model country. Imported organic soybeans from China and Ukraine are the most frequently used protein source for organic pig production in the EU. Due to the upcoming removal of the EU option of including 5% non-organic protein in the feed ration for the pigs, the need to identify alternative and competitive organic protein sources becomes urgent and, which paves the way for legume-based feeds such as peas, lupines, and fava beans.

The case study builds on desk research, interviews with organic pig producers and a workshop in Denmark. To ensure that the practical challenges and routines in organic pig farming are brought forward and considered, the case study collaborates with the association Organic Denmark.

Today, Denmark lacks 30,000 tons of organic protein feed and the market gap will increase further in the coming years. By 2020, it is anticipated that 200,000 organic pigs will be slaughtered in Denmark compared to 160,000 in 2016. But, increasing the cultivation and application of legume-based feed such as faba beans will not be a sufficient solution, as the amino acid profile of the faba beans does not fulfill the pig's nutritional requirements. Danish farmers grow organic faba beans already for the feed industry, but the economics and efficiency of the supply chain needs further improvement if the cultivation of organic legumes is to be increased.

Furthermore, legumes are experiencing competition from alternative organic protein sources such as processed starfish, seaweed or clover grass but, the production and use of the alternative protein sources have not yet taken off in industrial volumes. The conclusion is that the market for organic legumes for feed is growing but to exploit the opportunities for legumes in this context requires new ways of collaboration within crop production and logistics.

3.3.5) Fava bean Protein Isolate - Production, Properties, Utilization

Jesus Oviedo Palomino, Frank Pudel

PPM Pilot Pflanzenöltechnologie Magdeburg e.V., Berliner Chaussee 66, 39114 Magdeburg, Germany.
www.ppm-magdeburg.de, www.fava-net.de

Faba bean (*Vicia faba*) is one of the oldest crops of the world. It belongs to the legume family. The high protein content and nutritional value predestine faba bean to be a new alternative protein source. PPM developed a new process in order to produce faba bean protein isolate characterised by high purity (> 90 % protein) and exceptionally high yield (> 60%). The resulting faba bean protein isolate is of light-yellow colour, tastes neutral, is almost completely soluble at pH7, has excellent stickiness and binding behaviour and shows good emulsifying and film forming properties. Therefore, there is a wide range of utilization possibilities for faba bean protein isolate both in food and in non-food applications.

FAVA-NET is a network of German SME and R&D institutions aiming to establish a new value-added chain based on faba bean protein isolate production and utilization.

3.3.6) Extrusion of pea and oat ingredients to produce a healthy expanded snack

Catia Saldanha do Carmo

NOFIMA AS, Norway.

Consumers and the Food industry are demanding healthier and tasty snacks. Legume seeds have high nutraceutical appeal and they can produce foods with a balanced amino acid composition when mixed with cereals. The aim of this study was to investigate the production of an expanded snack entirely based on pea- and oat-ingredients using extrusion technology. The effect of the die temperature and feed moisture content were investigated aiming at maximizing expansion, texture and sensory perception. Higher expansion and higher crispiness of snacks were obtained at a die temperature of 160 °C and a blend moisture content of 11.2 %. The snacks processed at optimum conditions also presented positive sensory attributes, highly correlated to the parallel parameters determined by texture analysis. The feed moisture content was the parameter that most influenced final extrudate properties/responses. The gross composition of the raw-material was not modified by extrusion.



3.3.7) Overview of breadth and diversity for peas - TRUE CS 12

Karen Hamann

Institute for Food Studies (IFAU), Denmark, Karen@ifau.dk

The purpose of the case study is to provide an overview of the breadth and diversity of peas and, as such, it will serve as a model for the (unexploited) opportunities for processing legumes. The case study will list the many options available for processing peas and highlights the difficulties of policy making progress towards larger pea acreage in EU. The case study will map assortment and innovations within peas for human consumption (green peas and dried peas) by fresh, frozen and processed products; peas for food ingredients (including the range of pea-based ingredients, their applications and potential); and peas for use in feed. Market shares for organic pea products will be estimated. In addition, the case study will investigate the assortment of pea seeds available and the characteristics of the different varieties thus providing an understanding of how different varieties can have different purposes. This will also include heritage crops.

The case study will also provide an overview of how peas and processed pea-products are traded in the local and international markets emphasising the role of Canada (a major supplier in the global market). The case study will investigate the role of technology in driving the demand for peas, particularly in relation to food ingredients. An overview of the by-products from pea processing will provide insights into yet unexploited sources that could be used for building new value chains. The case study's findings will be compared with the diversity of high protein non-legume-based feeds, such as wheat and oil seed mixtures. The case study will provide conclusions on the need for and challenges related to policy making, and for market and value chain integration to accommodate a larger agricultural area with pea crops in Europe.

3.3.8) Retailer-producer quality chains and innovations - TRUE CS 9

Karen Hamann

Institute for Food Studies (IFAU), Denmark, Karen@ifau.dk

The assortment of food and drink products made with legumes is very wide, with traditional products such as canned, fresh and frozen legumes being the main traded goods. New products play a key role in driving market dynamics. Bringing new products (food and drink) made with legumes into the retail market can provide a big challenge for large as well as small producers. A thorough understanding of the supply chain, market power and, market drivers are crucial for decision making on entering the market with a new legume-based product. By analysing the food retail markets in Denmark, Germany, the UK, the Netherlands and Greece, this case study provides detailed findings about retailer-producer quality chains for legume-based products.

The case study builds on interviews with key market actors; observations of assortment, prices, brands and products in retail stores; and analysis of retail market structures and market dynamics. To identify and understand the differences between the countries under study, additional interviews are gathered from the market sessions at the regional Legume Innovation Network meetings. Challenges related to product development and marketing in practice are investigated in collaboration with North Jutland Food Cluster, thus using Denmark as a model country.

Across the EU, the key market driver for having more legumes in the food chains is health. This is instigated primarily as a growing demand for plant-based protein to reduce consumption of animal protein, and secondly as a choice of food to match the consumer's lifestyle such as a 'flexitarian' diet with a convenient access to relevant products. Food manufacturers aim to launch new or reformulated products into the retail market that cater to consumers' motivations for food choice making "health" a key quality criterion for marketing new products. Health is not a "one-size-fits-all" quality criterion, as health may be defined by attributes such as vegetarian, vegan, organic, low-fat, fresh or otherwise. An important conclusion is that the market for innovative legume-based products is driven by a strong interest in plant-based diets and a continuously widening of the assortment of products to meet the consumers' lifestyles especially targeting the segments of health and convenience.

3.3.9) Legumes in public and private food service - TRUE CS 11

Karen Hamann

Institute for Food Studies (IFAU), Denmark, Karen@ifau.dk

Food service accounts for approximately 25 % of the food consumed in the EU. Food service includes the public sector (hospitals, school meals, army etc.) and the private sector (company canteens, restaurant chains). Procurement of food items for the public food service market is subject to government regulations and plans including the Green Public Procurement Criteria of the EU.

Procurement strategies for food in private and public food service outlets can be influenced by schemes such as the Danish Organic Eating Label. This case study investigates how government regulations and public and private schemes can impact the procurement strategies in the food service sector towards a greener purchasing of food. The Organic Eating Label was introduced by the Danish government in 2009 to promote organic food in the private and public food service outlets. By 2018, nearly 2,500 public and private outlets were certified with a Gold, Silver or Bronze status within this label. The status refers to the share of organic food in the total food purchase, hence a Gold label equals an organic share of 70-100 % organic food. Outlets that are certified have developed 'greener' menus, reduced food waste, and purchase more seasonal produce.

The case study builds on desk research, interviews with key market players and regulators and, observations of menus, purchasing lists, and procurement criteria. Denmark and the UK are used as model countries, and the Green Public Procurement strategies are investigated at EU level and for the model countries. Green Public Procurement (GPP) is an EU initiative instigated as a management tool to increase sustainability through the outlining of framework conditions for government procurement. Food is included as one of the categories in the Green Public Procurement initiative in line with building materials, medical devices etc. The GPP lays down the detailed requirements for public procurement contracts and for food and includes specifications for numerous food categories. However, legumes are not mentioned at all. This paves the way for investigating how legumes are used in the public food service sector, how legumes are mentioned in procurement contracts, the drivers for sustainability as a purchase criterion and the role of schemes in driving the food service market. The findings will point to policy issues to be addressed to achieve greener food procurement strategies with legumes playing a central role.

4. Outputs of discussions

4.1 Summary of discussions

The participants were divided into 3 break-out groups after the presentation by Eszter Kelemen on “Policies to support legume-based systems”. Dr Kelemen argued that the dependency of the EU on legumes for feed and the fact that the EU is not self-sufficient in legumes constitutes a paradox. She outlined six policy pathways to be considered to tackle this paradox, three of which were chosen as topics for further discussions during the break-out sessions. These were:

1. **public-private partnerships;**
2. **certification and labelling; and**
3. **agro-ecological approaches.**

4.2 Break-out group 1: Public-private partnerships to support innovation

Facilitator: **Eszter Kelemen**; Rapporteur: **Pernille Bramming**

Policy case studies showed that public-private partnership for innovation might be crucial to answer technological lock-ins. Can such partnerships fill existing knowledge gaps (e.g. at the farmers-, producers- or consumers-level)? Can such partnerships contribute to the development of new products and to a change in consumer attitudes?

Participants at the workshop discussed how innovation is framed in the Atlantic region. Various existing examples of creating space for innovation were mentioned, especially from Denmark and Germany e.g. via enabling regulation, funding and networking opportunities. Partnerships for innovation cannot be considered in this context as a new policy pathway, as it has a long tradition.

Which are the **critical aspects of innovation partnerships** that need careful management and/or further improvement?

- There are still **knowledge gaps and data limitations** concerning legumes, especially in smaller companies and in some countries. Innovation could benefit from knowledge exchange between leading knowledge holders (e.g. universities, research institutes) and the advisory system.
- **Consumer involvement in innovation** can improve consumer commitment and lead to a change in attitudes. Media might play a crucial role in the kind of image created for an innovative product or legumes in general.
- **Intellectual property rights** should be considered when discussing innovation. Innovation in general could benefit from free use / open source information, but this might go against market interests and the protection of intellectual property.
- **Market opportunities** for new, healthier and more environmentally friendly products (such as legume-based food) should be improved. Clear messages for marketing such products

are needed, but in order to elaborate these messages (e.g. “eat healthier”) data gaps should be filled (e.g. do not rely on US nutrition data). Labelling policy or retailers’ shelf-policies could be improved to give more room and more visibility to such products.

- Policies to support legume-based innovation can only be successful if they **target both the Push and Pull side**. Infrastructure development over the longer term is an important enabler of innovations.

Which are the **relevant policy fields** that can directly or indirectly boost legume-based innovation?

- Innovation policy (strategic directions, funding, intellectual property rights, support research and networking).
- Food & farming regulations in general (increased flexibility could provide more room for experimentation and innovation, although food safety should not be compromised).
- Indirectly influencing policies might involve:
 - labelling (provide more information on health and environmental impact of products);
 - green public procurement (push for healthier, more legume-based diets);
 - health and nutrition (push for healthier, more legume-based diets).

The more diverse the partnership, the better chance the innovation process has for achieving success. Among the **actors who could be part of innovation partnerships** mentioned by participants were legislators and funding bodies, universities and advisory bodies, farmers and producers, market actors such as supermarkets, public food caterers and fast food outlets and finally consumers.



4.3 Break-out group 2: Certification and labelling

Facilitator: **Pete Iannetta**, Rapporteur: **Fanny Tran**

A possible pathway to trigger the policy changes needed to support the establishment of sustainable legume markets and supply chains could be dedicated certification and labelling in order to better acknowledge the ecological functions of legumes and reward farmers/producers. The group discussed whether this might be an answer to limited profitability of legume production?

The relevance of this pathway was questioned, since the **awareness of the positive aspects of legumes is very low**. There is an urgent need for education on legumes, since even many scientists do not know that legumes fix N from the air, and that legumes can be used to ensure natural N cycling.

In terms of labelling, emphasising on organic produce raises several issues and difficulties. For example, Danish farmers are dependent on imports of organic soya from China for feed, but trust in Chinese organic certification is generally low.

The participants wrote their ideas on post-its and this resulted in the following suggestions:

- an **LCA label** could be useful: all impacts on the environment should be taken into consideration, *i.e.* carbon footprint, use of water, use of energy *etc*;
- **extend the GMO labelling** to include the feed of dairy cattle and laying hens *etc*;
- education on legumes;
- **tax on N fertilizer building** on the “polluter pays” principle;



4.4 Break-out group 3: Agro-ecological approaches

Facilitator: **Roger Vickers**; Rapporteur: **Becky Howard**

The discussion included the following points:

- There are issues of **scalability and price** related to legume cultivation
- Local produce is required, and diets need to change
- There has been an increase in the number of legume products in the European market, is this a prompt for regional production? Should we focus on innovation?
- The public must be better introduced to the benefits of legumes and to legume-based food products, and demand for local produce will follow
- What is local? Do we mean regional, national or EU? There has been a loss of traditional local legume varieties cultivated
- Demand should be encouraged through **public procurement**
- Price is the biggest factor determining choice and local supply chains aim to encourage different pricing approaches
- Local production may lead to production of species and varieties not well adapted to the local conditions and this will affect the price of locally produced products
- Do people really understand what an ‘agro-ecological’ approach is? Do we need to educate them? How do we bring this approach into current systems and educate the public?
- Genetically Modified Organisms (GMO) and new technologies with higher specificity – this should be part of a programme to increase legume/ protein production
- There are many misconceptions about what exactly GMO’s are and whether they are innately good or bad. BUT they should be used within an agro-ecological approach.
- Education is required to change attitudes to Genetic Modification to allow higher levels of acceptance
- There is **lack of availability of legumes in menus** in some countries and further education is required on preparation and cooking of legumes.

4.5 Results of the final open discussion

The discussion was facilitated by Karen Hamann (IFAU) who invited the participants to consider the question of: **what makes a supply chain resilient so that it can withstand changes in markets and production conditions?** She also asked participants to **consider the strengths and weaknesses** in relation to a simplified supply chain: Agriculture – Process – Market.

Participants were invited to write their considerations and ideas on post-its and to attach their post-its to a board, divided into six squares, representing strengths and weaknesses of each part of the chain. The result was more than 50 post-its.

Agriculture

Factors highlighted by the participants as having potential to improve resiliency in agriculture were sustainable crop production systems and **diversification** of the use of the crops including residues and **by-products**. Factors identified as making the cultivation of legumes vulnerable were the unstable price structure and the unstable output. In terms of agriculture, it was argued that the first step for encouraging cultivation of legumes should be to build up the capacity to produce enough legumes to **meet the demand for feed** in Europe.

Processing

Factors highlighted by the participants for improving the resiliency of the supply chain were **diversity of suppliers and products**. **Novel food legislation** and legislation on ingredients were mentioned as factors that could make supply chains vulnerable. Canning and freezing was considered to be of less importance by the participants compared to new product categories, for example, snacks and high-protein foods. The possibilities for transforming pulses into products by using different technologies and accessing such technologies needs to be further explored.

Market

Participants highlighted short supply chains as important for improving the resiliency of markets, since short supply chains form a direct connection between buyers and sellers. For a short supply chain of **locally cultivated products** the local/regional knowledge of the products are advantages, while seasonal scarcity might prove to be challenging. Another strength mentioned was cultural traditions and expectations, which can reinforce the appreciation of local food. The positive impact on the environment and climate from cultivating legumes was regarded as a strength in general that could be good for marketing and increasing demand for pulse-based products, while the lack of knowledge of the benefits of legumes was considered a weakness.

In terms of the food market, **competition is driving innovation**, and it was argued that we must think innovatively and move away from imitating meat and dairy products with legume-based alternatives. In the food industry, it is possible to develop new flavours and new products. Participants agreed that the way forward could be to develop new products and then create the market.

Overall, **most participants focused on agriculture or market, not processing**, and Karen Hamann asked the participants why? During the final open discussion, participants exchanged views on this question and others:

- The reasons for the lack of focus on processing could result from a **lack of knowledge of the technologies available**. Today processing equipment is available for small-scale production and for processing of large quantities. It is a question of showing an entrepreneurial approach and to have the vision and capabilities to start building up a network with processors, technology providers and business partners.
- Possibilities of creating a **more diverse supply chain** were also discussed, with the perspective of **linking up with bio-fuel** etc. appearing especially promising. Exploring **more by-products** in order to enhance sustainability and thinking of non-food use of legumes would also be a way forward, e.g. since legumes are high in waxes.
- It was also stated, that a huge **marketing effort** is needed as consumers do not always make logic choices, and there are even “anti-legume” websites to counter. It is not possible to rely on the vegan and vegetarian movements since they are very small segments in the market. Some participants, though, did not see the need for marketing if the number of products is limited. They would rather focus on the changing food habits and create new taste and new products, establish a new value chain and **create the demand**. Overall, considering knowledge, education and culture is crucial for developing the market for legume-based products.

In his **closing remarks**, the project coordinator Pete Iannetta said that this is very much a starting point, *“I feel there is a general lack of appreciation and so responsiveness of governments’ in their understanding and appreciation of legumes, and in taking responsibility for implementing concerted policies to improve personal- and environmental-health. Consequently, and at least for now, it will be largely up to consumers and scientists to drive positive change. I trust our discussion of legumes will go on, and that elements of our dialogue will serve a foundation of fundamental knowledge-based, common ‘legume literacy’ if you like, and communicated to all consumers. Going forward, the EU has committed to increasing support for sustainable food systems by one third, and that should help our cause.”*



Group discussions with participants



Presenting results on post-its

5. Fieldtrip report: Visiting Daloon Factory

On May 8th, the A-LIN delegates were invited to visit the Daloon Factory, www.daloon.dk. Daloon is a major Danish producer of convenience food, especially spring rolls and vegetarian convenience products made with legumes.

Mr. Mik Rubjerg, Sr. Product Developer welcomed the delegation and explained the history of the company. It was founded by an immigrant from China nearly 100 years ago and today the company is a category leader in spring rolls in Danish and British supermarket sectors. Product development is a high-priority topic and new products made with peas, beans and chickpeas are in high demand from customers in the retail market. The spring rolls are made with beansprouts (mung beans) and Daloon imports and sprouts the beans at the factory.

After the introduction, the delegation was shown around the factory, where they visited all parts of the production from cutting of raw materials to baking and packing of the spring rolls as well as the sprouting department.



The TRUE delegation exploring the Daloon factory – vegetable cooking area



Examples of legume-based products made by Daloon



TRUE Project coordinator Pete Iannetta pointing at the Bean Sprout – the Daloon sprouting bean department



The TRUE delegation exploring the Daloon factory – spring roll processing area



Acknowledgements

We especially thank all presenters for sharing their knowledge, results and experiences. We also thank all participants for their valuable contributions and insights into their experiences. We thank IFAU and Organic Denmark for being our hosts and Barney's Beer for providing us with bean beer. We would also like to thank the Sinatur Hotel for the perfect services and great atmosphere. And we extend many thanks to Mik Rubjerg for hosting the delegation and showing us the Daloon factory.

Disclaimer

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Available online at: www.true-project.eu.



Annex I: List of presentations and posters

A copy of all the presentations and the posters have been uploaded to the TRUE website [here](#).

Presentations

1. **Presentation to the TRUE project** - Pete Iannetta, Project Coordinator, James Hutton Institute, UK ([download slides](#))
2. **Using legumes for production of alcoholic drinks** - Kirsty Black, Master Distiller, Arbikie Distillery, UK ([download slides](#))
3. **Faba beans in fish feed, challenges and opportunities** - Berthel Vestergaard, Sourcing Manager, BioMar A/S, Denmark
4. **Policies to support legume-based systems. What can innovation and regional development policies offer?** - Eszter Kelemen, ESSRG, Hungary ([download slides](#))
5. **Local products and plant proteins at Sinatur Hotel Storebælt** - CEO Jan G. Larsen, Sinatur Hotel Storebælt, Denmark
6. **More legumes in crop rotations: challenges in Danish organic agriculture** - Lars Lambertsen, Senior Advisor, Organic Denmark, Denmark ([download slides](#))
7. **Turning organic clover grass into a sustainable source of feed protein** - Erik Fog, Senior Advisor, SEGES Organic Innovation, Denmark ([download slides](#))
8. **Environmental efficiency of human nutrition from chickpea pasta versus durum wheat pasta** - Sophie Saget and Michael Williams, Trinity College Dublin, Ireland and Marcela Porto Costa, Bangor University, UK ([download slides](#))
9. **Pulses: Tackling Present and Future Food Trends** - Thomas Hoehndorf, Area Sales Manager Grain Milling, Bühler Group, Scandinavia
10. **Funding that makes a difference: the case of COOP Crowdfunding** - Nicolai Jaepelt, Coop Crowdfunding, Denmark ([download slides](#))
11. **Exploring business cases for legumes, lessons learned so far** - Karen Hamann, IFAU, Denmark ([download slides](#))

Posters

1. [Enabling legume processing: opportunities and barriers – TRUE WP9](#)
2. [Production of proteins for feed and food from lucerne and clover grass](#)
3. [Blue lupine for white shrimp \(*Litopenaeus vannamei*\) - TRUE CS 15](#)
4. [Market model for legume-based feed for organic pig production - TRUE CS 10](#)
5. [Fava bean Protein Isolate - Production, Properties, Utilization](#)
6. Extrusion of pea and oat ingredients to produce a healthy expanded snack
7. [Overview of breadth and diversity for peas - TRUE CS 12](#)
8. [Retailer-producer quality chains and innovations - TRUE CS 9](#)
9. [Legumes in public and private food service - TRUE CS 11](#)

Annex II: Participants - summary

Stakeholder Groups

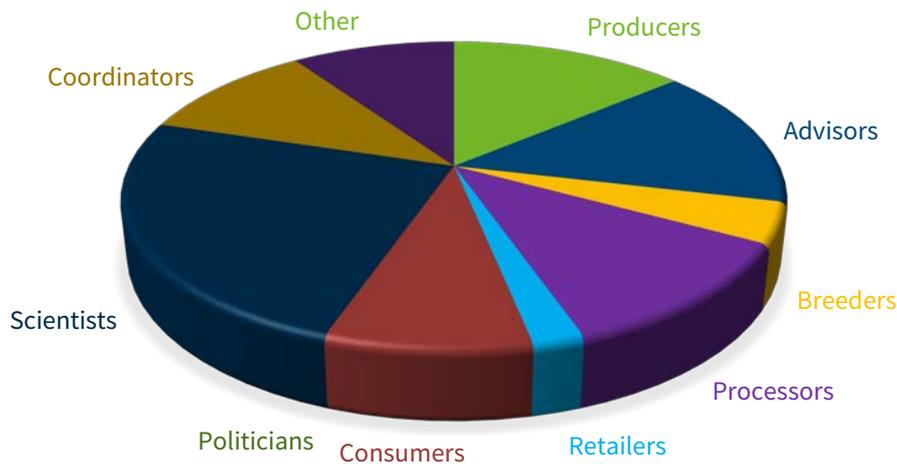


Table 1: Number of participants of each stakeholder group (multiple selection)

Producer	Advisor	Breeder	Processor	Retailer	Consumer	Politician	Scientist	Coordinator	Other
13	14	4	11	2	8	0	23	10	9

Legumes

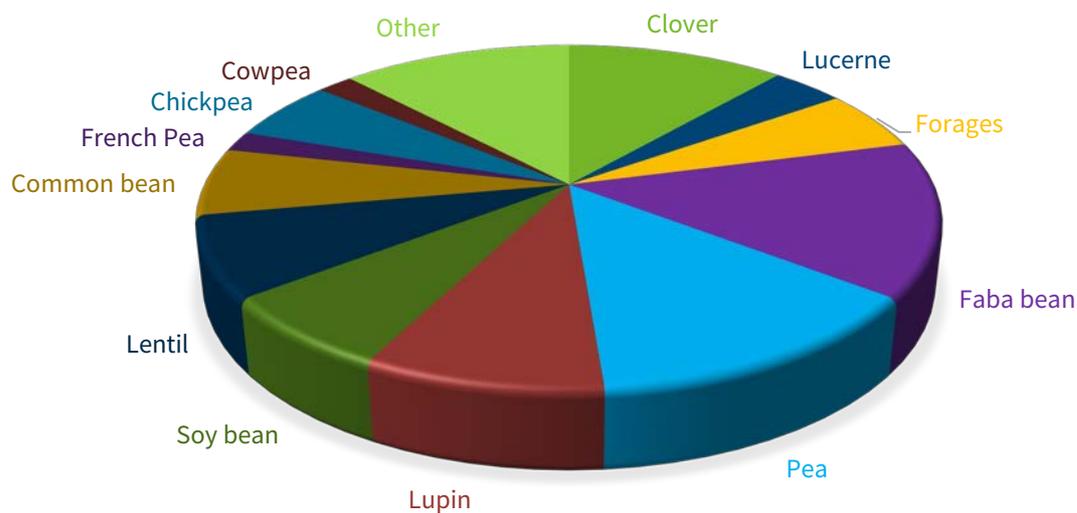


Table 2: Number of participants working with the different types of legumes (multiple selection)

Clover	Lucerne	Forages	Faba bean	Pea	Lupin	Soy bean	Lentil	Common bean	French Pea	Chickpea	Cowpea	Other
18	6	9	23	21	14	11	12	10	3	9	3	19

Table 3: Participants list

Speakers in bold letters, TRUE members in italic letters

Nr.	Organisation	Name	Country
1	Aalborg Universitet	Mette Lübeck	Denmark
2	Aalborg Universitet	Peter Stephensen Lübeck	Denmark
3	<i>Agri Kulti</i>	<i>Attila Králl</i>	<i>Hungary</i>
4	<i>Agri Kulti</i>	<i>Gábor Bertényi</i>	<i>Hungary</i>
5	AGT Foods Europe	Leo Leeggangers	The Netherlands
6	Alfred-Wegener-Institute (AWI)	Sinem Zeytin-Schüning	Germany
7	<i>Arbikie Distilling Ltd</i>	<i>Kirsty Black</i>	<i>Scotland</i>
8	Arla Foods	Saeed Rahimi Yazdi	Denmark
9	<i>Bangor University</i>	<i>David Styles</i>	<i>United Kingdom</i>
10	<i>Bangor University</i>	<i>Marcela Costa</i>	<i>United Kingdom</i>
11	BioMar A/S	Berthel Vestergaard	Denmark
12	Bühler	Thomas Höhndorf	Sweden
13	Centrovic	Jens Kr. Ege Olsen	Denmark
14	Coop Crowdfunding	Nicolai Jaepelt	Denmark
15	Coop Trading	Mette-Marie Palle Jørgensen	Denmark
16	Dalum Agricultural College	Jens Diederichsen	Denmark
17	Dalum Agricultural College	Daniel Frandsen	Denmark
18	Danish Technological Institute	Mads A.T. Hansen	Denmark
19	Danish Vegetarian Association	Katrine Ejlerskov	Danmark
20	DLF Seeds and Science	Mette Jespersen	Denmark
21	Danish Vegetarian Association	Monica Lund-Bedsted	Denmark
22	<i>ESSRG</i>	<i>Eszter Kelemen</i>	<i>Hungary</i>
23	FAVA-TRADING GmbH & Co. KG	Alexander Rosenow	Germany
24	Gate2Growth	Carmen Socaciu	Denmark
25	<i>IFAU Institute for Food Studies & Agri Industrial Development</i>	<i>Pernille Bramming</i>	<i>Denmark</i>
26	<i>IFAU Institute for Food Studies & Agri Industrial Development</i>	<i>Karen Hamann</i>	<i>Denmark</i>
27	IFRO Institute for Food and Resource Economics, University of Copenhagen	Gylling Morten	Denmark
28	<i>IGV GmbH</i>	<i>Nora Löhrich</i>	<i>Germany</i>
29	<i>James Hutton Institute</i>	<i>Fanny Tran</i>	<i>United Kingdom</i>
30	<i>James Hutton Institute</i>	<i>Pietro Iannetta</i>	<i>United Kingdom</i>
31	LandboSyd	Birgitte Popp Andersen	Danmark
32	Lihme Protein Solutions	Bodil Lindved	Danmark
33	Naturland, Demonet Erbo	Werner Vogt-Kaute	Germany
34	NOFIMA AS	Catia Saldanha do Carmo	Norway
35	Organic Denmark	Jesper Fog-Petersen	Denmark
36	Organic Denmark	Lars Lambertsen	Denmark
37	<i>PGRO</i>	<i>Becky Howard</i>	<i>United Kingdom</i>
38	<i>PGRO</i>	<i>Roger Vickers</i>	<i>United Kingdom</i>
39	Process Design A/S	John Seneberg	Denmark
40	ProteinCrop	Ambreen Shah	Denmark



Nr.	Organisation	Name	Country
41	SEGES	Erik Fog	Denmark
42	<i>TCD Trinity College Dublin</i>	<i>Sophie Saget</i>	<i>United Kingdom</i>
43	<i>TEAGASC (Agriculture and Food Authority) Ireland</i>	<i>Dan Clavin</i>	<i>Ireland</i>
44	The Danish Veterinary and Food Administration	Eva Hedegaard	Denmark
45	<i>University of Hohenheim</i>	<i>Henrik Maaß</i>	<i>Germany</i>
46	VIFU - Videncenter for fødevareudvikling (Danish Knowledge Center for Food Innovation)	Britt Sandvad	Denmark
47	ZBC Zealand Business College	Randi Vinfeldt	Denmark
48	Vicapeal Invest	Søren Helmer Jensen	Denmark
49	Vicapeal Invest	Victoria Helmer Jensen Stausholm	United Kingdom

Annex III: Invitation and programme

Enabling Legume Processing: opportunities and barriers

2nd Legume Innovation and Networking (LIN) Workshop for the Atlantic and Boreal Region

Nyborg, Denmark
Tuesday 7th May 2019





Foreword from the host

On behalf of the TRUE Project, the Danish Institute for Food Studies & Agro Industrial Development (IFAU) we welcome you to the 2nd Legume Innovation and Networking (LIN) workshop for the Boreal/Atlantic Region. The workshop is entitled

Enabling Legume Processing: opportunities and barriers

This workshop represents an exceptional opportunity to **profit from the insight, research and experiences of the TRUE Project-partners and stakeholders from the whole legume value chain and to explore innovative practices of legume processing.** You will:

- meet innovators, producers, researchers and advisors;
- gain insights into five cases combining the use of processed legumes and successful marketing to make profits in a sustainable manner;
- be updated on EU policies on innovations and development of concern to the LIN; and,
- share your knowledge, experiences and ideas with the delegates.

The output of the workshop will be used in the forthcoming production of a **toolkit for sustainability** and in developing **EU policy recommendations.**

Below, you will find a detailed programme and all the necessary details regarding your participation, travel and accommodation whilst in Nyborg.

Yours sincerely,
Karen Hamann

Institute for Food Studies & Agro Industrial Development Aps (IFAU), Denmark

karen@ifau.dk / T. + 45 45 57 05 82





Meeting Programme - Tuesday 7th of May

- 9:00** **Registration – coffee and croissants**
- 9:30** **Welcome** - Karen Hamann, IFAU, Denmark
- 9:45** **Presentation to the TRUE project**
Pete Iannetta, Project Coordinator, James Hutton Institute, UK
- 10:00** **Using legumes for production of alcoholic drinks**
Kirsty Black, Master Distiller, Arbikie Distillery, UK
- 10:20** **Faba beans in fish feed, challenges and opportunities**
Berthel Vestergaard, Sourcing Manager, BioMar A/S, Denmark
- 10:40** **Coffee break**
- 11:00** **Policies to support legume based systems. What can innovation and regional development policies offer?** - Eszter Kelemen, ESSRG, Hungary
- 11:20** **Break out groups - Session 1:**
Discussion on policy changes needed to support the establishment of sustainable legume markets and supply chains.
- 12.20** **Local products and plant proteins at Sinatur Hotel Storebælt**
CEO Jan G. Larsen, Sinatur Hotel Storebælt, Denmark
- 12:30** **Lunch**
- 13:30** **More legumes in crop rotations – challenges in Danish organic agriculture**
Lars Lambertsen, Senior Advisor, Organic Denmark, Denmark
- 13:50** **Turning organic clover grass into a sustainable source of feed protein**
Erik Fog, Senior Advisor, SEGES Organic Innovation, Denmark
- 14:10** **Environmental efficiency of human nutrition from chickpea pasta versus durum wheat pasta** - Sophie Saget and Michael Williams, Trinity College Dublin, Ireland and Marcela Porto Costa and David Styles, Bangor University, UK
- 14:30** **Coffee break**
- 14:50** **Pulses – Tackling Present and Future Food Trends**
Thomas Hoehndorf, Area Sales Manager Grain Milling, Bühler Group, Scandinavia
- 15:10** **Funding that makes a difference – the case of COOP Crowdfunding**
Nicolai Jaepelt, COOP Crowdfunding, Denmark
- 15:30** **Exploring business cases for legumes, lessons learned so far**
Karen Hamann, IFAU Institute for Food Studies, Denmark



- 15:50 Break out groups - Session 2:
Discerning indicators of a sustainable processing chain**
- 16:50 Conclusion: Upscaling sustainable production, processing and marketing of legumes – What does it take?** - Plenary discussion moderated by Karen Hamann
- 17:15 Closure of the meeting**, afterwards informal farewell reception to enjoy Barney's Beer brewed with beans

1. Practical information and prebooked options

- Pre-booked **stands** are available from Tuesday morning and are located in the area where we will have the coffee breaks; Feel free to bring roll-ups, brochures, flyers and product samples;
- **Posters** are displayed on the walls of the conference room and should be ready before the meeting starts.

Monday, 6th of May

19:00 Informal dinner at Café Apostrof (www.cafeapostrof.com)

A table has been booked for 19:00 and dinner will be at your expense. The café is only a 20 minutes' walk from the Sinatur Hotel ([link to google map](#)). **If you want to join, please confirm by sending an email to Karen@ifau.dk no later than May 3rd.**

Tuesday, 7th of May

19:00 Get together dinner at Sinatur Hotel (*pre-booked*)

A set menu of two courses will be served; dinner will be at your own expense, please register before April 26th if you would like to take part.

Wednesday, 8th of May

10:00 Company visit: Daloon Factory (*optional, space limited*)

- We will visit Daloon Factory in Nyborg. Senior product developer Mik Ruberg will give a presentation on how Goodlife Foods meets the growing demand for more sustainable and vegetarian products and has marketed products such as meatfree spring rolls, burgers, samosas and snack bites. Daloon Factory is a major Danish food producer with an annual turnover of € 25 million (2017).

Departure from the hotel at 9:40 by foot (14 minutes) or taxi.