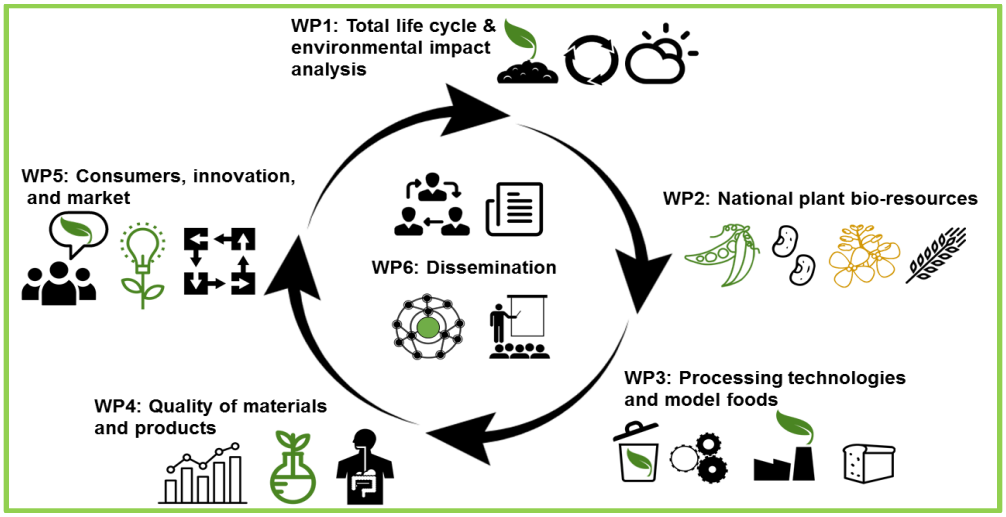
Newsletter 2- April 2018

FoodProFuture: Innovative and sustainable exploitation of plant proteins in future foods

The first year in FoodProFuture!

One year has past since the Kick-off Meeting was held in the FoodProFuture project. This has been a busy year, but also very fruitful with a lot of interesting discussions and learnings from the diverse disciplines that are integrated in this project. We have had more than 10 meetings in the WP-leader team, and even more meetings to plan and integrate activities and deliverables from one WP to another, so all activities can run smoothly. Peas, faba beans and oats have been produced, seeds have been dry-fractionated, products have been made and quality have been assessed. Consumer attitudes have been studied, the first report on plant protein trend in Norway are written, and data for life cycle analyses are prepared. The PhDs and Post Docs in the project are positioned, altogether seven people, that are highly qualified! They bring valuable competence to the project group. We also experience that students are willing to do their master thesis within the project activities. The first one is presented in this Newsletter. We experience that our topics are frequently debated in the society, by stakeholders, industry and politicians, and that further knowledge are sought. This make our work even more meaningful. We look forward to the second year, to see more results coming, deeper discussions, and more dissemination!

Anne Kjersti Uhlen
Project leader



For more information about the project, activities, and highlights from the first year, please visit the project web-site: https://www.nmbu.no/en/projects/foodprofuture

WP3: Processing technologies and model foods

Catia Saldanha do Carmo, Nofima

The continuous world population growth induces a total protein demand increase based mainly on plant sources. There is a growing interest and need to create **novel ingredients** from plant origins that have the ability to replace animal-based food products. Innovative and sustainable processing technologies are necessary to utilize plant resources into tasty, healthy and attractive plant-based food products *with **high protein content**. The Work Package 3 (**WP3**) aims to produce **protein-rich ingredients (I)** and **model food products (II)** based on dry fractionation combined with other sustainable processing technologies.*

Obtaining protein-rich fractions from plant sources using sustainable processes

Interest has grown in separating pulse crops into their component parts (protein, starch and fiber), and using these components as ingredients in food systems (Figure 1). The conventional route to obtain plant protein ingredients is wet extraction, which involves the use of large amounts water and chemicals. An alternative route for ingredient production that avoids the addition of water and retains functionality of components is **dry fractionation**. These less destructed enriched fractions can lead to improved technical properties, such as solubility, gelling and emulsification capacity related to components still being in their native state. However, it should be realized, though, that air classified protein concentrates from legumes still contain bio-active components, which are hardly present in protein isolates obtained through wet fractionation, such as antinutritional factors that may influence the uptake of nutrients during digestion.

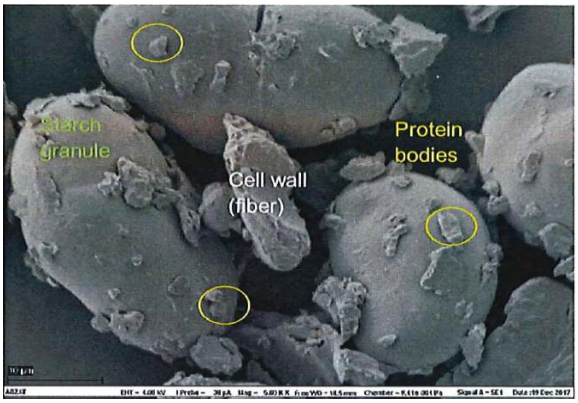


Figure 1: Scanning Electron Microscopy (SEM) of pea flour obtained from dehulled peas (before fractionation) Imaging Center, NMBU

Under **WP3**, pulse-rich fractions from whole and dehulled peas (Figure 2) and beans grown in Norway were obtained using milling and dry fractionation. Furthermore, to separate pea and bean flours in their protein, starch and/or fiber fractions, air classification and conventional/vacuum sieving methods were assessed. The obtained fractions from peas and beans were further characterized regarding their solid state (morphology and particle size distribution) and composition.

Obtained fractions are being used to produce innovative model food products with improved nutritional value and health benefits, such as, higher digestibility, satiety improvement and cholesterol lowering capacity.

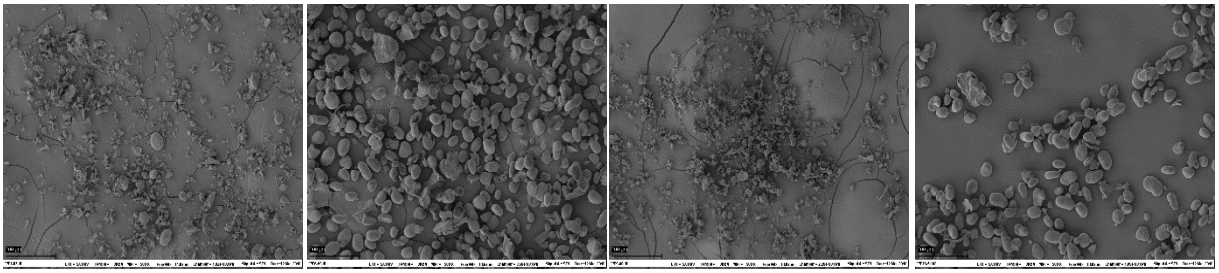


Figure 2: Scanning Electron Microscopy (SEM) of air classified pea flours: *a) Fine-fraction (protein-rich) obtained from whole peas; b) Coarse-fraction (starch-rich) obtained from whole peas; c) Fine-fraction (protein-rich) obtained from dehulled peas; d) Coarse-fraction (starch-rich) obtained from dehulled peas Imaging Center, NMBU*

Developing innovative and added-value model food products using sustainable technologies

Pulse-rich fractions obtained by milling and air-classification are being incorporated into innovative model food products with improved health, sensorial and functional properties mostly through **extrusion technology** (Figure 3).

Different **model food products** are being developed under WP3, namely pasta products, snacks and meat analogues/replacers. Model food products produced using other technologies (non-extruded) are also planned to be developed under WP3, such as, bread, sweet-baked foods, beverages and yogurts.

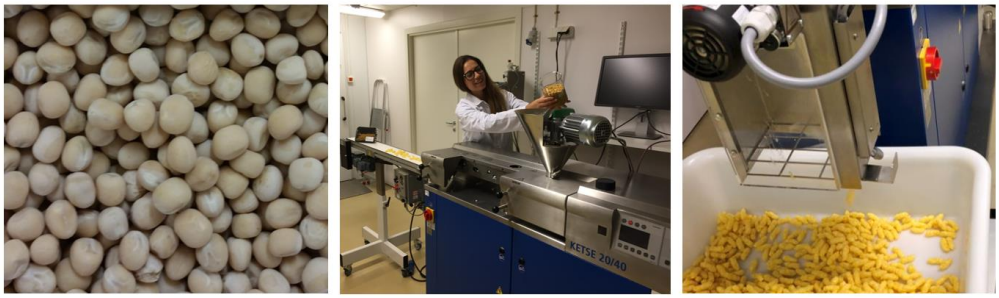


Figure 3: Extrusion technology at NOFIMA

Peas and faba bean in crop rotation

PhD student Anne Marthe Lundby, NIBIO Øst

Field peas at flowering stage.
Foto: Unni Abrahamsen

A good crop rotation mitigates the build-up of pathogens and pests that often occurs when one species is continuously cropped, and can improve soil structure and fertility by alternating deep-rooted and shallow-rooted plants. Crop rotation with grain legumes have well known benefits for the enhancement of wheat yield. As well as reducing the levels of cereal disease, legume break crops, such as peas and faba bean, also fix nitrogen from the air. Legumes have nodules on their roots which contain nitrogen-fixing bacteria called Rhizobia. Grain legumes grown in rotation with cereal crops provides a beneficial N contribution to following cereals.

Today, field peas and faba beans are grown in a limited extent in Norway. In 2017 the areas were approximately 15 000 daa peas and 12-13 000 daa faba beans, used for animal feed. Cultivation of grain legumes in Norway is associated with a higher degree of risk compared to cereals. Furthermore, the access to pea and faba bean cultivars that are adapted to the growing season in Norway is also more limited, as there are not breeding programs for these crops in Norway. The benefits of including peas and faba beans in the crop rotation are well recognized by clever farmers, giving increased economic gain. Thus, there are a willingness to utilize these crops among farmers, and which may be increased if markets also for food grades are established.

When cultivating peas, the main challenge is lodging, which leads to difficult harvesting conditions. Shorter varieties, with strong **straw** are therefore desirable. The cultivar Ingrid has been the most important in recent years. This is a long cultivar, but with strong straw, high 1000 seed weight and yield. Based on extended variety screening trials conducted in FoodProFuture in 2017, Astronaut appears to be a promising cultivar, with high protein content and yield. Intercropping peas with oats, barley and oilseeds was tested FoodProFuture in 2017, and has been shown as a potential strategy to reduce lodging.

The main challenge when cultivating faba bean, is its late maturation and harvest. Faba beans are a long season crop, and the cultivation area is therefore more limited in Norway. The two most important cultivars on the market in Norway have been Kontu and Columbo, where Columbo has been the

most cultivated. In recent years, the cultivars Isabell and Vertigo have also been on the marked. Two new Finnish cultivars, Louhi and Sampo, have been tested in trials 2015-2017, and will probably be on the market for 2019. These are promising early cultivars with high yield, that can expand the cultivation area for faba beans in Norway.

Maturation of field peas at Apelsvoll in 2017. Faba beans (to the right) are still green.
Foto: Unni Abrahamsen

New Post Doc in FoodProFuture:

Katja-Maria Prexl, Postdoc WP5

I have just finished my PhD project at Zeppelin University (Lake Constance/Germany): "Contextualization of Individual Absorptive Capacity". After graduating from economics, communications, and cultural study programs in Mannheim, Newcastle upon Tyne, and Friedrichshafen, I worked for various companies and startups in diverse industries. Over the course of my PhD project, I have been conducting experiments to determine individual absorptive capacity and innovative capabilities within a corporate context applying qualitative and quantitative results. I lectured the course "Foresight, Innovation and Design Thinking" and cooperated with companies such as Bosch, IBM, Deutsche Bank and Siemens. I am looking forward to bring along and combine my experience and tools in the "FoodProFuture" project with all WPs and project partners: to continuously gain and understand insights to increased consumption, use and sales of plant based food; to translate this in scenarios and create pictures of the future; develop human-centered innovation concepts for the sustainable food value chain; to match consumer and market needs and help to experience the "new"; to design (thinking) and facilitate the joint development; and to jointly accelerate the learning and application process for sustainable food production. Moreover, I would like to help all project partners to efficiently use their capacity to generate ideas, nurture the knowledge platform and identify opportunities to apply it jointly in profitable ways.

New Master student linked to FoodProFuture:

Sine Martine Steien

Study program: Food Science and nutrition, Specialization in food production and product development.

Master thesis: Functional properties in Faba Beans

Objectives: Characterize functional properties of protein fractions in Faba Beans, and to evaluate utilizations in the food industry.

Experiments/analyses: Analyses of protein soluability, viscosity, gelling ability, foaming ability at varying pH and ionic strength**.**

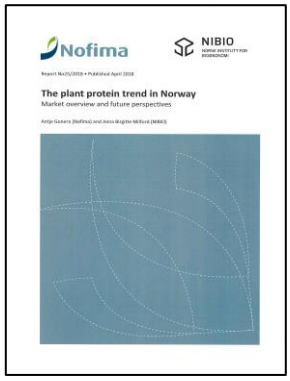
Deadline for delivery: 15. mai 2018

New report published from FoodProFuture;

The plant protein trend in Norway –

Market overview and future perspectives

Antje Gonera (Nofima) and Anne Birgitte Milford (NIBIO)



In a short period of time there has been a rapid increase in the market for Norwegian branded plant protein processed products, among which some are imported, others produced in Norway. Other countries have a much more developed market from both a producer, technology, and product diversity point of view. Norwegian producers are using already *available machinery* for the production processes, and *mainly imported ingredients* such as soya or pea extracts. Norwegian produced *potatoes* and *egg whites* are also used. In order for plant protein products to succeed in Norway, we identify some key factors: One is *increased knowledge*, about both production processes and consumer needs and preferences. The industry also needs to be willing to *think more disruptively* in order to achieve innovations in this market segment. Furthermore, both the industry and policy makers can put a much stronger effort into *educating consumers*, in order for consumers to familiarize themselves with plant protein products and their benefits concerning health and the environment.

See the report at :

https://www.nmbu.no/en/projects/foodprofuture


FoodProFuture