

Cerealier

No. 02/2023

A magazine from
Lantmännen
Research Foundation



STEP BY STEP

**Baking on an
industrial scale**

RESEARCH

**Yellow peas as
an ingredient**

DIETARY ADVICE

**New NNR
almost here**



THEME
FOOD
PROCESSING



Helena Fredriksson Bakes and preserves

By the time this year's second issue of Cerealier is published it will be June, and lots of exciting things will be happening. The new edition of the Nordic Nutrition Recommendations will be presented before the end of June, with an international conference on oats being organised in Lund at about the same time, and the month concludes with this year's open call from the Lantmännen Research Foundation.

THE THEME FOR THIS ISSUE is food processing, a much-discussed subject. We begin with an interview with one of the authors of a report on processed food ("Processade livsmedel") – a review of what processing on an industrial scale entails and its impact on our food. Something that many people perhaps don't think about is that we process food at home when we cook dinner and bake bread, make pickles or jam. We also talk about research in which new processing technologies are used to develop innovative foods and ingredients.

IN CEREALIER'S CEREAL SCHOOL we explain the structure of a cereal kernel, what wholegrain means and what happens to our four most common cereals when they are milled.

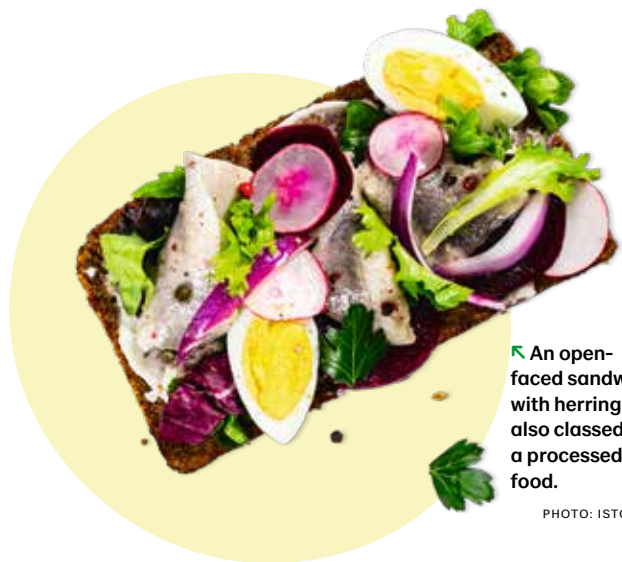
We round off with an inspiring recipe for a summery barbecue burger, one that you can either do yourself or buy readymade.

Wishing you a pleasant read!

Helena Fredriksson

Lantmännen Research Foundation

"Something that many people perhaps don't think about is that we process food at home when we cook dinner and bake bread or make pickles or jam."



An open-faced sandwich with herring is also classed as a processed food.

PHOTO: ISTOCK

Food processing

In this issue we cover new research on processing for healthier and more sustainable foodstuffs.

Pages 7–15

Cerealier

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PHOTO: WAGENINGEN RESEARCH



PHOTO: VTT



PHOTO: ERIC GEVAERT / ISTOCK

Cerealier Regulars

- 4 News
- 21 Recipe
- 22 From my perspective
- 23 News from Lantmännen Research Foundation

Theme: Food processing

- 8 Report on processing
- 10 Step by step – how wholegrain bread is made industrially
- 12 Combined processing technology saves resources
- 14 Process development at Wageningen Research

In this issue

- 16 Nutrition recommendations support increased intake of wholegrains and legumes
- 18 Cereal school, part 2: Different parts of the kernel have different properties
- 20 Broad cooperation to increase interest in wholegrains

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LANTMÄNNEN
RESEARCH FOUNDATION

Missed goal for reduced salt intake



In a new report the World Health Organisation (WHO) states that we will not achieve the goal of a 30 per cent reduction in global salt intake by 2025. According to the WHO, seven million lives could be saved by 2030 if more measures were taken to reduce salt in food.

Example measures include targets for the salt content of food, introducing labelling and requirements for reduced salt in food in public-sector meal procurements.

Currently, only five per cent of WHO member states are assessed to be using adequate strategies to lower salt consumption. WHO has classed the countries' efforts on a four-level scale, where four is "best". Sweden is level two. ●

Read more: www.who.int

20

JUNE is when the new Nordic Nutrition Recommendations will be launched. ●

Thesis on fava beans

Klara Nilsson, from the Department of Molecular Sciences at the Swedish University of Agricultural Sciences, will be awarded her PhD on 9 June. Her thesis focuses on the structure and texture of fava beans in different products. ●

Read more: www.publications.slu.se



PHOTO: MILLOW

↑ Veggie balls made from mycelium, an alternative to meat.

Mushrooms instead of meat

For over twenty years, researchers at the University of Borås have studied filamentous fungi and their ability to utilise residual products for new areas of application, such as producing foodstuffs, ethanol and animal feed.

One result is an edible

filamentous fungus that can grow on residuals from the cultivation of cereals and vegetables.

A hybrid product that is a combination of mycelium and oats has been developed; it is called Millow and will be launched on the Nordic market. The researchers say the production of Millow is more efficient compared to

that of other plant-based meat alternatives.

"The technique is based on a new preparation of fungus and cereals that provides an advanced texture without any food binders, thanks to the natural properties of the fungi," says Mohammad Taherzadeh from the research group. ●

Read more: www.hb.se

Fava bean genome mapped

An international research group has succeeded in mapping the fava bean's genome, which is its entire genetic code. This information can be used to identify specific genes, such as those for seed size, an important property when used as a food. The group includes researchers from the universities in Helsinki,

Aarhus and Reading, as well as LUKE, Finland's natural resources institute. This mapping allows researchers to continue working with characteristics such as nutritional quality and taste, and how these are affected by processing.

Read more: www.helsinki.fi





Dietary advice for six to eight slices remains

In the 1970s, Brödinstitutet – the Swedish bread institute, launched its campaign: “the Board of Health and Welfare recommends six to eight slices of bread per day”. This has been followed up at a seminar, where the conclusion was that the advice remains relevant, particularly for wholegrain bread.

Swedes eat around 50 kilos of bread per person every year. Bread is also Swedes’ main source of wholegrains. Roger Andersson, professor of food science at the Swedish University of Agricultural Sciences, spoke at the seminar.

“If you eat fibre-rich bread you gain a lot else too, such as antioxidants, vitamins and minerals. This is called the dietary fibre complex.”

Andersson stated that dietary fibre is good, but wholegrains are even better.

“Increasing your intake of wholegrains is important effect in preventing cardiovascular disease. Bread and other grain products are our most important sources of dietary fibre, which is because we eat a lot of cereals here in Sweden.”

CECILIA MAYER LABBA, who recently received her PhD from Chalmers University of Technology, has researched nutritional uptake from plant-based meat substitutes. She saw that there is reduced absorption of iron, for example, from vegetarian meals compared to ones that include meat. But she also showed that there are ways to increase uptake, such as by baking with sourdough. This reduces the amount of phytic acid in

the bread, a substance that prevents absorption of iron and zinc.

TO ROUND OFF, researchers were asked how consumption of wholegrains could be increased.

“One way is to use new processing technologies. For example, a type of mill that can produce even finer flour, so the amount of wholegrains in bread could be further increased without a negative effect on the flavour,” said Andersson.

“Through innovation and process – if we can follow it and measure it, we can also affect it,” concluded Mayer Labba.

Karin Janson

Read more (in Swedish): <https://www.brodinstitutet.se/opinion-och-media/seminarier/6-8-brodkivor-vad-hande-sedan-2/>

Grants for research about the food system



The Kamprad Family Foundation has granted funding to “Enabling

change towards sustainability – finding common ground to accelerate food system innovation and transformation”, a project led by Elin Rööf at SLU.

It will be run in partnership with researchers from the Netherlands and the UK. ●

Read more (in Swedish): www.slu.se/ew-nyheter/2023/3/tre-slu-projekt-beviljas-medel-fran-familjen-kamprads-stiftelse/



Large-scale cultivation of Swedish chickpeas

This year, some farms in Sweden will grow chickpeas on a larger scale.

For six years a company called Kalmar Ölands Trädgårdsprodukter has conducted field trials of different chickpea varieties in partnership with organisations such as Rural Economy and Agricultural Societies. The difficulty has been finding the right seed.

The best crop came from a Greek variety, which is calculated to yield a total harvest of about 80 tonnes. Chickpeas will be cultivated on the islands of Öland and Gotland, as well as in Skåne and Östergötland.

This is the first time that chickpeas will be grown on such a large scale in Sweden. ●



International conference on oats

The 2nd Food Oats Conference will be held 19–21 June in Lund, Sweden.

The theme is “Oats for

future – dietary fibre and other bioactive compounds”. Researchers from Finland, Norway, Sweden, the UK and the US will give lectures on plant breeding, processing

and health. The conference is organised by the ScanOats research centre. ●

Read more: www.foodoatsconference.com

Higher prices reduce purchases of fruit and vegetables

The Swedish Food Agency has conducted a survey showing that four in ten consumers are buying fewer fruit and vegetables due to increased food prices.

In the long term, changed eating habits risk having a negative effect on public health. Previous statistics from Eurostat show that Sweden is already among the European countries in which people eat the least fruit and veg, in terms of portions per day.

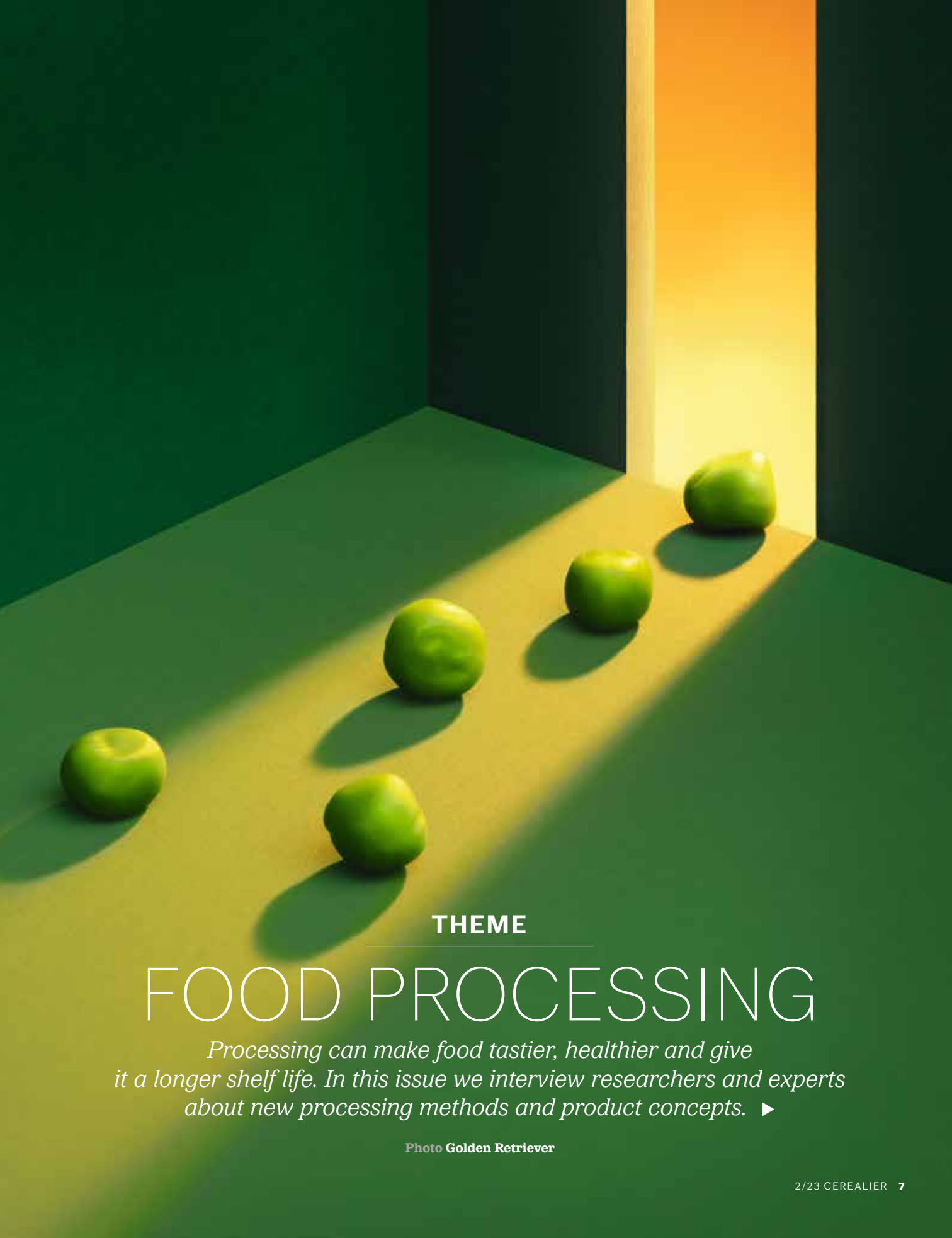
In 2019, 7.6 per cent in Sweden said they ate at least



five portions of fruit and veg per day, compared to the EU average of 12 per cent. In the Nordic countries, consumption in Sweden was about the same

as in Norway, but lower than in Finland and Denmark. ●

Read more: www.livsmedelsverket.se (in Swedish)



THEME

FOOD PROCESSING

Processing can make food tastier, healthier and give it a longer shelf life. In this issue we interview researchers and experts about new processing methods and product concepts. ►

Photo Golden Retriever



↑ Cecilia Nälsén,
Örebro University.

Report on processing will bring clarity

The concepts of processed and ultra-processed food rouse strong feelings. That much of the food we eat is processed is nothing new, but it says very little about whether or not it is good for us. A new report clarifies the concepts.

Text Per Westergård

To increase understanding of what food processing entails and how it affects nutritional content, Cecilia Nälsén from Örebro University has compiled a literature review on the subject along with other researchers in food science and nutrition. The report is called *Processade livsmedel (Processed Foods)* and includes everything from various food processes to how these affect nutrient content and our health, and the structure of the current classification system.

ULTRA-PROCESSED FOOD is a term that does not have a fixed definition. However, researchers have created different models that classify foods based on the degree of processing. The best known one is the NOVA system from 2009, which was created by two nutrition researchers in Brazil with the aim of helping consumers choose food that is nutrient-dense but has limited calories.

The Brazilian researchers are not the only ones to try to create a system using

the degree to which a food is processed. There are a range of systems, but they all have their limitations.

“It is easy to understand the purpose of the classifications, but unfortunately they often don’t achieve their goal. The degree of processing is a very inexact concept, nor do we need advanced systems to understand why we should eat limited amounts of ‘capacity food’, which is food with low nutrient density and high calorie content,” says Cecilia Nälsén, editor-in-chief of the *Nutritionsfakta* portal.

“Instead of talking about processing as a problem, I believe it is better to state the problem more precisely, that much of the food we now eat is poor in both nutrients and fibre and contains too many calories and too much salt.”

Nälsén believes that we must make it easier for consumers to make good choices.

“It is important to state that both healthy and less healthy food can be prepared from scratch, just as it is possible to choose healthy and less healthy readymade food.”

Cecilia Nälsén
Örebro University

“But they don’t get this help from the concept of ultra-processed, because it includes such a wide range of foods that the result is more confusing than helpful. For example, the NOVA classification means that industrially baked wholegrain bread is defined as ultra-processed.”

Ultra-processed food is a difficult phenomenon to manage because the level of processing alone does not say much about the quality of a food.

“In our report, we try to highlight the potential positives with advanced technologies and processes. This includes examples such as producing formula milk and many of the vegetarian alternatives that have appeared in the last few years.”

ALTHOUGH NÄLSÉN IS critical of the concept of ultra-processed food, she believes that the health effects that are associated with processing should be highlighted. The report therefore describes what can happen when food-stuffs undergo industrial processing.

“There is a great deal to be done, but I also think we should be reflective. It is important to state that both healthy and less healthy food can be prepared from scratch, just as it is possible to choose healthy and less healthy ready-made food,” she says. ●

Read the report here (in Swedish):
www.nutritionsfakta.se

FOOD PROCESSING

Baking wholegrain bread using rye and oats requires knowledge and specific stages in the process if the bread is to be of good quality.

Text **Karin Janson**

Step by step – how wholegrain bread is made industrially

Wheat flour contains threads of gluten, forming a skeleton that provides volume and texture when bread is baked. Rye flour does include gluten, but it is a different type to that in wheat and has shorter threads that cannot build a stable network. This is why bread that is only baked with rye flour is flat.

OATS DO NOT contain gluten, so wheat flour is often added when baking with wholegrain flour from rye and oats.

“Thirty per cent oat flour is a common mixture if you want a bread with volume. This can be increased up to fifty per cent, but that is a greater challenge. Bread can be baked using only rye or oat flour in crisp bread or soft flatbread,”

says Seija Sulanto, who works with research and development at Lantmännen Unibake.

HOME BAKERS CAN bake bread in about the same way and using the same steps as an industrial bakery. The difference is the need for precision in the industrial scale,” says Sulanto.

“At home, you can check whether your sourdough is ready or if it needs to ferment a little longer. A production line is used in industrial bakeries, where everything happens at set points and at fixed intervals, so it is necessary to ensure that the quality of the ingredients is always consistent, particularly of the flour.”

The main components of the baking process are described in the picture to the right. ●

How bread with a high proportion of rye and oat flour is baked industrially:

9

Package

The soft, flat buns are packaged in a machine. They have a shelf life of 4–5 days in the food store.

8

Slice

The bread is sliced in a machine.

7

Cool

The bread is cooled quickly in a cooling tower, so it can be sliced or cut without being sticky. This step is rarely used in a home kitchen.

1

Sourdough production

The sourdough is started and fermented in controlled conditions, for 12 to 18 hours. A home baker can start their own sourdough or buy a readymade starter.

2

Knead

Flour, water, salt and sourdough are processed slowly using a dough blender in a tray, with a little added yeast to help with proving. At home, dough is kneaded by hand or in a food processor.

3

Rest

Rye doughs need to rest for 20 to 60 minutes, oat doughs slightly less.

4

Shape

The dough is rolled and shaped in a machine. At home, this is done by hand.

6

Bake

The bread is baked at 300°C. A lower temperature is often used in a home oven.

5

Prove

The dough rises (proves) for 40 to 60 minutes at a controlled temperature and humidity. A home baker can adapt the proving time to the temperature of the kitchen.



The environment, health and economic sustainability are keywords in the development of new food processes at Finland's VTT research institute.

We always try to consider these three criteria, says researcher Pekka Lehtinen at the unit for grain processing technologies.

Text **Karin Janson**

Combined processing technology saves resources

Two years ago, VTT started its own unit for processing technologies for cereals and legumes.

“We have long conducted this type of research and have solid expertise. Right now, we are putting a great deal of focus on how to get more out of each raw material and how to use ingredients in new ways in food and drinks.”

AT VTT, RESEARCHERS produce meat substitutes, as well as drinks, bread, cereal flakes and snacks from cereals and legumes. One unit works with cell cultivation – a technology in which yeast or bacteria cells are grown in fermentation tanks and produce proteins, fatty acids or other nutrients. In the future, cell cultivation may supplement field cultivation. According to the researchers, the benefits of cell cultivation are that it is not dependent on growing seasons, land availability or plant protection products.

“We work with the cell cultivation unit and are examining the potential for combining cell cultivation with other processes. For example, side streams

from traditional cultivation can be used to feed the cell cultivation and vice versa, and side streams from cell cultivation can be used as an ingredient in food,” says Lehtinen.

ONE COMBINED TECHNOLOGY that VTT has just developed is called cascade fractionation (see image). This is an example in which existing technologies are used together to increase efficiency and circularity.

“When we produce concentrated ingredients from green proteins, we use

either dry fractionation or wet extraction. In dry fractionation, the raw ingredient is first milled and then separated by particle size, into individual fractions where components like protein, starch and fibre are enriched. Dry fractionation usually uses less power and water than wet extraction. Wet extraction produces a more concentrated protein extract and purer side streams, for example.”

SEVERAL DIFFERENT PROCESS technologies are combined in cascade fractionation. First, pre-treatment is carried out, removing the hull and other unwanted parts of the plant. These go to a side stream, which could be used for feeding cell cultivation.

After milling, the material is separated using *dry fractionation*. In addition to a protein-rich fraction, a starch-rich fraction is created.

“The starch can be used in foods, such as in dairy analogues like yoghurt, as well as for brewing beer,” says Lehtinen.

In the next stage, *wet extraction*, the material has already been pre-treated by dry fractionation. Compared to only using wet extraction, this reduces water and power consumption.



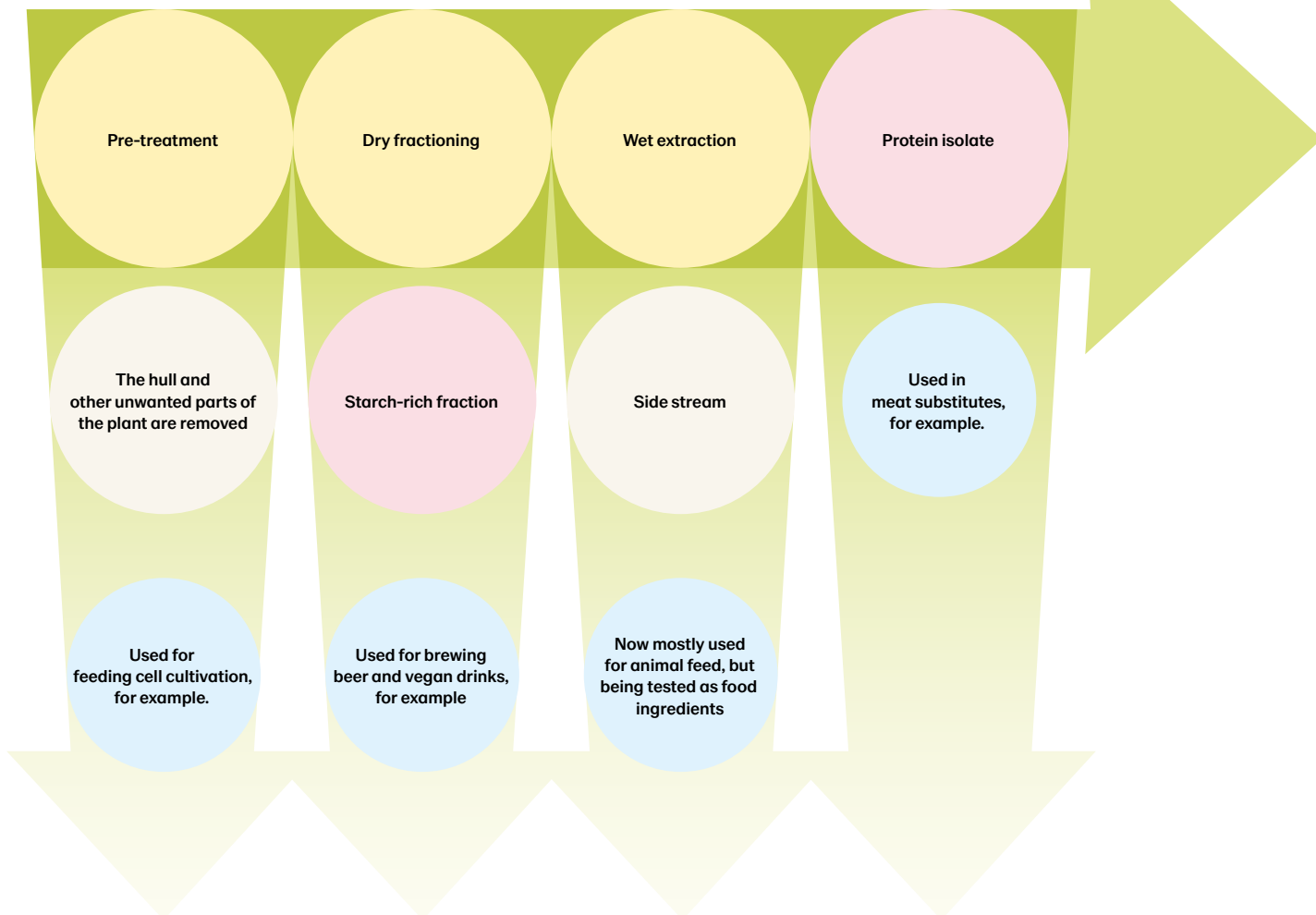
PHOTO: VTT

“The starch can be used in foods, such as in dairy analogues like yoghurt, as well as for

brewing beer.”

Pekka Lehtinen, research group leader for cereal processing technologies, VTT

Cascade fractioning – how does it work?



“Side streams from wet extraction are now mostly used for animal feed, but we are conducting trials on using them in foods, for example after fermentation,” says Lehtinen.

The final product is a high-quality protein isolate, that can be used in meat analogues.

“We have tested cascade fractioning with fava beans and had good results, but I can also see how the technology can be used with other legumes and cereals.”

In terms of nutrition, Lehtinen does not believe that cascade fractioning has a greater effect on content than other processing technologies.

“There could potentially be a sensory

difference because we remove problematic elements, such as anti-nutritional substances, at an earlier stage of the process. But we will look more at the nutrient profile in the future.”

Lehtinen and his research colleagues are working on a publication about cascade fractioning, focusing on energy savings and product properties. It will be published later this year. ●

VTT

VTT is a state-owned research institute in Finland. VTT cooperates with and develops products for businesses, and conducts its own research as well as research that is funded by external parties, such via EU grants.

↑ Cascade fractioning saves resources because the raw material undergoes dry fractioning prior to wet extraction.

Process development at Wageningen Research

In the Netherlands, Wageningen Research develops new process technologies for products such as meat substitutes, cheese and drinks from cereals and legumes. One current research project is investigating the use of new plant-based ingredients in food.

Text Karin Janson

Soya, wheat and peas are the primary ingredients used in meat substitutes in the Netherlands.

“To decrease dependence on a few crops, chickpeas, yellow peas, rapeseed, sunflower seed, fava beans and potato are being researched as protein ingredients in food. Potato has an amino acid profile that, in principle, is comparable to eggs and milk. When potato starch is extracted, it is also possible to remove potato protein,” says Jacqueline Berghout, researcher at the food technology unit, Wageningen Research.

MANY PLANT-BASED INGREDIENTS require resource-demanding processes to become foods, but Berghout describes many of the methods used by Wageningen Research as mild.

“What we mean by that is that the raw material is not exposed to high temperatures or pressures, and the aim is to reduce the consumption of water and energy.”

Process technologies that are not yet available on a larger scale are evaluated in the lab. One example is electrostatic separation, which is used to separate

a raw material’s different components. This is a technology in which the powder particles in pea flour or wheat bran, for example, are blown and then charged in a drum, before being separated using an electrical field.

“This method allows protein to be enriched in a fraction in a manner that is not possible in traditional dry fractioning. But this is still a dry method where there is no need to add water, so it uses fewer resources than standard wet fractioning,” says Berghout.



↑ Shear cell technology produces vegetable products with a fibrous structure.

“This method allows protein to be enriched in a fraction in a manner that is not possible in traditional dry fractioning.”

Jacqueline Berghout, food technology researcher, Wageningen Research

One of the biggest challenges is the juiciness of meat substitutes such as mince, veggie burgers and balls.

“One important aspect for juiciness is the ability to hold and release liquids. We have processed oil plants and lentils using a new technique developed by the university in Wageningen, called shear cell.

The raw material is processed in a cylinder with a cone and a rotating plate, creating fibre structures that are very suitable for use in meat substitutes.

ANOTHER PRODUCT CATEGORY that is in development is vegan cheese.

“Here, protein functionality is a challenge, creating something from cereal or legume protein that has the same functionality as casein (milk protein).”

Flavour is of course just as important as structure and nutritional content.

“We have an ongoing research project on plant-based foods that uses sensory science and what happens to a food in your mouth. We are trying to understand the mechanisms in food production that create particular flavours and taste experiences. We hope that our industrial partners can then use this knowledge when they develop new products,” says Berghout. ●

SHEAR CELL TECHNOLOGY

Shear cell creates fibre patterns, unlike extrusion that produces a layered structure. Shear cell is suitable for making larger and thicker meat-like pieces such as cutlets, while extrusion is better for smaller pieces and strips, such as veggie mince or kebab.

PHOTO: WAGENINGEN RESEARCH



PHOTO: SANDRA GUNNARSSON / GOGREEN

↑ Wageningen Research develops vegetarian products with various flavours and structures.



Nutrition recommendations support increased

The new Nordic Nutrition Recommendations, NNR2023, will be published at the end of June. They will be the foundation of national dietary guidelines in the Nordic countries and encourage increased consumption of both wholegrains and legumes.

Text Karin Janson

The previous Nordic Nutrition Recommendations, which were published as a book, had chapters only on individual nutrients. The new edition, which will be published digitally, also includes food groups.

“Our chapter authors have reviewed the research literature on various food groups, based on the aspects of complete nutrition, reduced risk of chronic disease and maintaining a healthy weight,” says Hanna Eneroth from the Swedish Food Agency, who is a member of the working group.

ONE CHAPTER COVERS cereals, both wholegrain products and sifted products. Meta analyses show that consuming three to seven wholegrain products a day is associated with a reduced risk of cardiovascular disease, type 2 diabetes, bowel cancer and mortality.

“We already know that there is strong evidence that dietary fibre and

wholegrains have a protective effect against chronic disease, and this has now been reinforced,” says Eneroth.

The lowest risks for obesity and



PHOTO: JEANETTE HÄGG LUND

“There is strong evidence that wholegrains have a protective effect against chronic disease.”

Hanna Eneroth
Swedish Food Agency



↑ The recommendations support increased cereal consumption, primarily as wholegrains.

PHOTO: MAGNUS MALMGREN / LANTMÄNNEN

intake of wholegrains and legumes

mortality were observed for three to seven portions of wholegrains per day, equivalent to 90 to 210 grams daily. There is less evidence for the health effects of sifted cereal products, so the recommendations suggest replacing these with wholegrains as far as possible. There are few research results for individual grains and the majority of research at population level has been conducted in countries that primarily consume wheat.

IN LEGUMES, SOYA has the strongest evidence for a reduced risk of disease as regards stomach, bowel, breast, uterine and lung cancers.

“The strong evidence for soya is because it is the legume on which most

research has been done, particularly in Asia, where large amounts of soya are eaten, for example as tofu. There is not enough research on other types of legumes and too little variation in intake to be able to draw conclusions at population level,” says Eneroth.

CONSUMPTION OF LEGUMES is associated with a reduced risk of obesity, but there is no clear link with type 2 diabetes. However, the draft recommendations do state that consuming legumes appears to have a positive effect on the biomarkers that prevent disease. Overall, NNR2023 encourages an increased intake of legumes.

A draft of the final version has been

sent out for consultation during the spring and the new version will be delivered to the Nordic Council of Ministers towards the end of June. A digital seminar will also be held. ●

Read more: www.helsodirektoratet.no

FOOD GROUPS IN NNR2023

Drinks (coffee, tea, sweetened and with sweeteners). Cereals. Vegetables, fruits and berries. Potatoes. Fruit juice. Legumes. Nuts. Fish, fish products and shellfish. Meat and meat products. Milk and dairy products. Eggs. Fats and oils. Sweets and baked goods. Dietary patterns. Meal patterns. Breastfeeding. Ultra-processed foods.

Different parts of the kernel have different properties

Most of us consume cereals every day, as bread, pasta, porridge or drinks. But what is the structure of a cereal kernel? And what is a wholegrain? We take a closer look in part 2 of Cerealier's cereal school.

Text Karin Janson

Illustration Lene Due Jensen

Our most common cereals – wheat, rye, barley and oats – have kernels with a similar structure, despite their different qualities and nutritional content. In wheat and rye, the husk (or hull) disappears during threshing, while oats and barley must be husked before they are used. The husk is mainly made from cellulose fibres.

THE GRAIN KERNEL'S three components are inside the husk: bran, endosperm and germ. The bran (the outer layer of the

kernel) has several cellulose-rich layers. Bran is rich in fibre, some B-vitamins and minerals such as zinc and iron. The endosperm tissue is surrounded by the aleurone layer and is found inside the protective layers of bran. The aleurone layer is rich in nutrients. During milling, the aleurone layer ends up with the bran. When all three components are included, in their whole, milled or crushed forms, the product is called wholegrain.

THE NUTRITIONAL CONTENT varies in the various parts of the kernel, so the fractions that result from milling have very different nutrient profiles. The more of the bran is milled, the higher the flour's extraction rate. A high extraction rate also entails a higher level of minerals, vitamins and fibres in the flour.

A wholegrain flour has an extraction rate of 100 per cent and contains the bran, endosperm and germ. A sifted

wheat flour has an extraction rate of around 80 per cent, and mainly consists of the endosperm.

The bran and germ have been removed from sifted wheat flour. The endosperm in a rye kernel is more difficult to separate from the bran than in wheat, so sifted rye flour has a somewhat higher content of fibre and minerals and is greyer than wheat flour.

BARLEY FLOUR HAS an extraction rate of around 85 per cent. The toughest outer parts of the husk can be cut away in a barley peeler, and the kernels are then milled into flour in a roller mill.

Oat flour can be produced by rolling and grinding the oat kernels.

Oatmeal is made from dehulled, steam-treated and rolled oat kernels, so oatmeal is wholegrain. Oatmeal with added fibre is a product in which oatmeal is mixed with extra bran from oats or wheat. ●

Wheat



The most common wheat flour for baking is plain flour, which is sifted wheat flour. Finely and coarsely milled wholegrain wheat flours are also available.

Wheat is usually divided into hard and soft, and strong and weak. The hardness is linked to the grain kernel's physical structure and how easily the

kernels can be milled. Strong and weak describe the quality of the protein. A flour that is milled from soft wheat with a lower protein content has a weaker protein, so is better for baking crumbly biscuits. The wheat flour used for baking bread is characterised by a higher level of protein and stronger protein. Hard wheats, such as durum, are more suitable for pasta, for example. ●

Rye



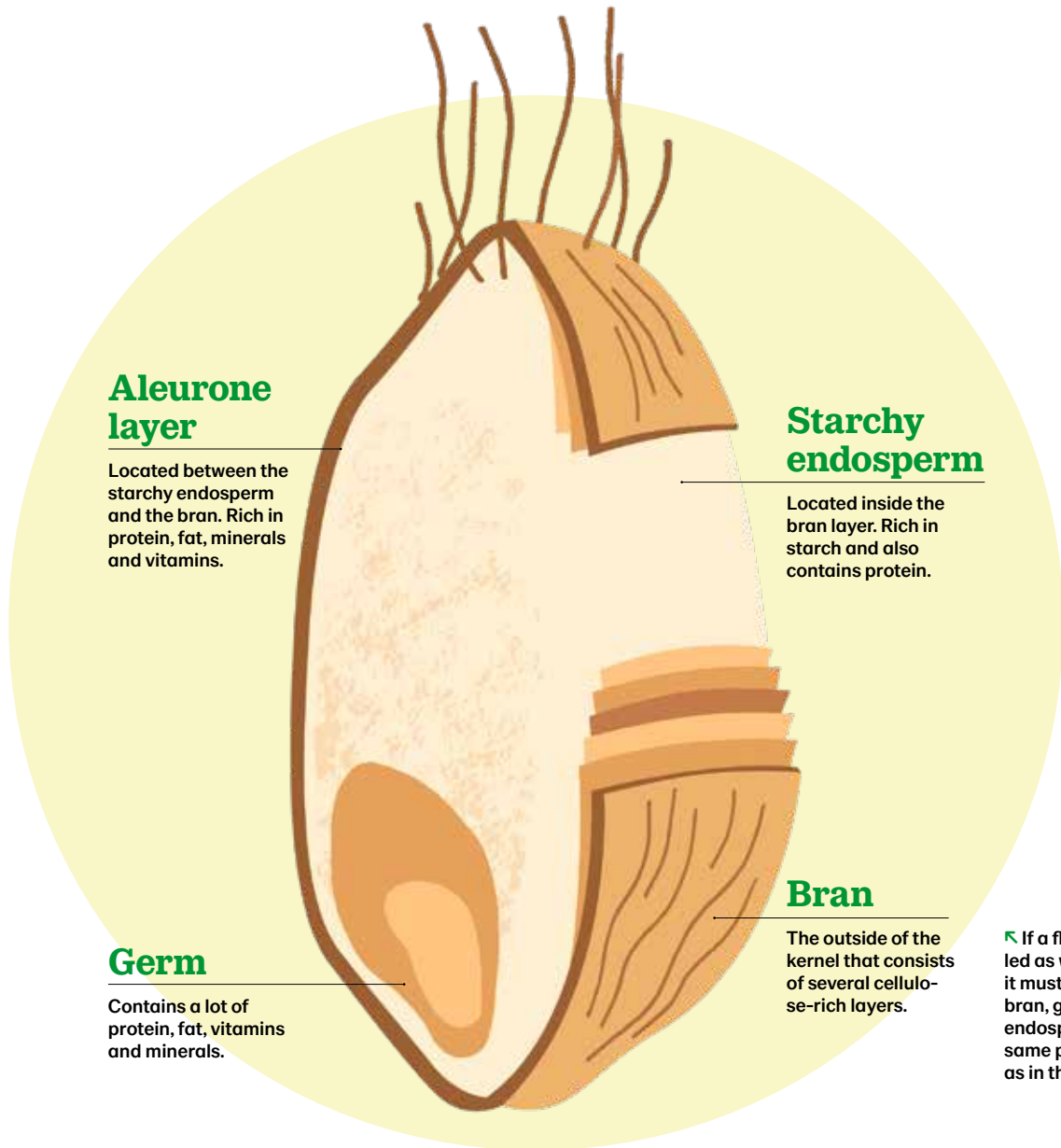
Rye endosperm contains less starch and protein than that of wheat, but instead it has more dietary fibres. These include arabinoxylan, beta-glucans and fructans.

Arabinoxylan is an important fibre when rye bread is baked, influencing factors such as water retention, elasticity and

viscosity, as well as the bread's volume and shelf life.

Consumers can choose between two types of wholegrain rye flour, coarse and fine, which have the same extraction rates but different particle sizes.

Blended rye flours are also available, often 60 per cent wheat flour and 40 per cent rye flour. The rye gives the bread character, and the wheat provides volume and structure. ●



Aleurone layer

Located between the starchy endosperm and the bran. Rich in protein, fat, minerals and vitamins.

Starchy endosperm

Located inside the bran layer. Rich in starch and also contains protein.

Germ

Contains a lot of protein, fat, vitamins and minerals.

Bran

The outside of the kernel that consists of several cellulose-rich layers.

☞ If a flour is labelled as wholegrain, it must contain bran, germ and endosperm in the same proportions as in the kernel.

Barley



Although barley was once an important part of the Swedish diet, it is now rarely used.

Barley is a grain that is rich in fibre. In barley's endosperm, the cell walls are 75 per cent beta-glucan, a soluble fibre that can help lower blood cholesterol levels. Barley is also rich in minerals such as

potassium, magnesium and phosphorus.

Barley flour can be used for baking, but because the gluten in barley does not build a strong network, it is best for more compact thin breads or crispbreads. ●

Oats



Nutritionally, oats stand out compared to other cereals thanks to their high fat and protein content, and the beta-glucan fibres that have beneficial effects on blood sugar responses and cholesterol levels.

Oats do not contain gluten protein, so pure oats can be eaten by people with celiac disease,

as long as no other cereals have been added.

Oat flour and oatmeal can be used for baking biscuits, bread and crispbread. Oat flour is usually combined with other flours for improved volume and structure. ●



PHOTO: ISTOCK

↑ The overall goal of FullkornsFrämjandet is to increase the consumption of wholegrains.

Broad Swedish cooperation to increase interest in wholegrains

An organisation called FullkornsFrämjandet (Wholegrain Promotion) aims to get Swedes to eat more wholegrains, by disseminating knowledge about their properties and highlighting their benefits for health and the environment.

Text Åsa Eckerrot

People are aware that wholegrains are beneficial and important sources of fibres, proteins, vitamins and minerals. Switching to wholegrain products is one of the best ways to prevent ill health. Grain products are also among the most climate-smart foods we can eat. However, despite this, only one in ten Swedes currently eats enough wholegrains. FullkornsFrämjandet is aiming to change this.

“The idea is that we – business, academia, the public sector and non-profit organisations – will work together to inspire people and highlight the benefits of wholegrains to different target groups. We are stronger together, and can reach more people with a shared message,” says Elisabet Rytter, manager for research and nutrition at the Swedish Food Federation.

FULLKORNSFRÄMJANDET has found inspiration from organisations such as the Danish Whole Grain Partnership and Oldways from Boston, US. Consumptions of wholegrains in Denmark has more than doubled, and sales of wholegrain products have taken off in the past decade. However, it took a few years before the change in volume was consistent and significant, according to Maria Sitell, dietician and head of communication at Brödinstitutet (Swedish Bread institute).

“The success in Denmark came from clearly communicating the wholegrain content on the products and the way that work was conducted as a cooperation between health organisations, public agencies, business and academia.”

FULLKORNSFRÄMJANDET is funded by its members who, separately and together will work on building public opinion and communicating the benefits of wholegrains. The organisation is currently in its establishment phase, with the aim being to attract as many stakeholders as possible. Statements of intent are being collected during the spring, the hope being to have enough members to start activities in the autumn.

Apart from highlighting the benefits of wholegrains to various target groups, work also involves inspiring companies to develop new wholegrain products and increase sales of these.

“Our overall goal is for the Swedish population to eat more wholegrains,” state Maria Sitell and Elisabet Rytter. ●

FULLKORNSFRÄMJANDET



Brings together academia, business, the public sector and non-profit organisations. The head office will be in

Stockholm. Maria Sitell and Elisabet Rytter have coordinated the initial work, which included Brödinstitutet, Chalmers, City of Gothenburg, Lantmännen, Leksands Knäckebröd, Swedish Food Federation, Nestlé, Paulig, Pågen, Sveriges bagare och konditorer, and the Swedish Heart Lung Foundation. Fazer, Polarbröd, Swedish Cancer Society, Swedish Food Agency and Wasa-Barilla have provided statements of intent for membership, and more are ongoing.

RECIPE

Beanburgers made from black beans

Tasty beanburgers made from black beans, simple to prepare and fry at home. Add half a packet of grilling cheese for extra saltiness, or a little sesame oil and sesame seeds for a rounder taste!

Black bean burger

20 minutes 4–6 burgers

- 2 packages (760 g) ready cooked black beans
- 1 red onion, peeled and finely chopped
- 1 garlic clove, peeled and finely chopped
- Handful chopped fresh herbs, e.g. parsley or basil
- ½ tsp salt
- ½ red chili, finely chopped
- 150 ml pumpkin seeds, coarsely chopped
- 4 tbsp potato flour
- Oil for frying

Serve with

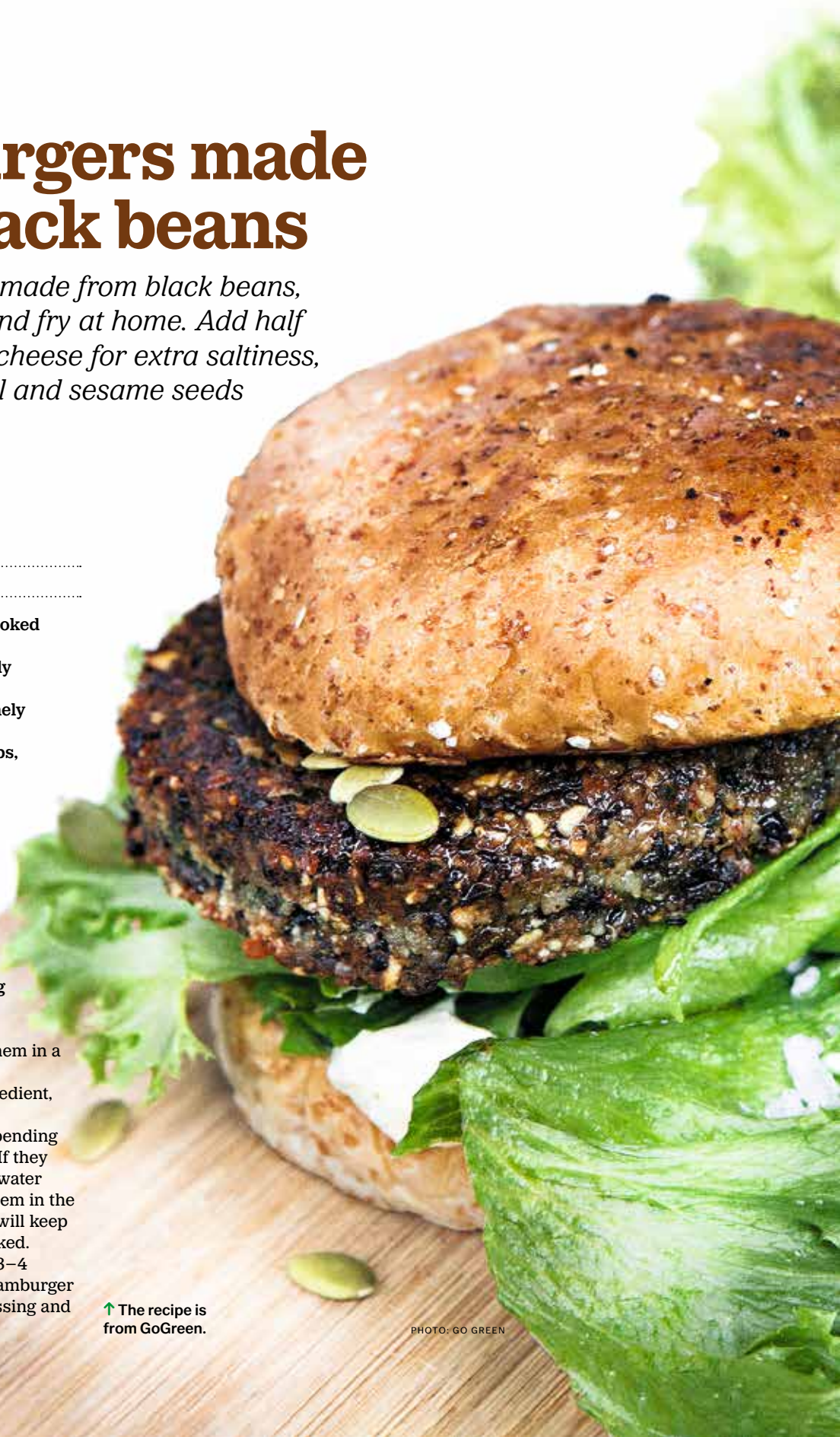
4–6 hamburger buns or pita bread, salad, dressing

INSTRUCTIONS:

1. Drain the beans and mash them in a mixing bowl using a fork.
2. Combine with the other ingredient, add the potato flour last.
3. Shape into 4–6 burgers (depending on how big you want them). If they are a bit crumbly, add some water and cooking oil. If you put them in the freezer for 30 minutes they will keep their shape better when cooked.
4. Brush with oil and cook for 3–4 minutes per side. Serve in hamburger buns or pita bread, with dressing and salad. ●

↑ The recipe is from GoGreen.

PHOTO: GO GREEN



FROM MY PERSPECTIVE

In these times of high inflation, cereal products have been overshadowed. But the opposite should be the case, writes Ingela Stenson, trend analyst at United Minds and editor-in-chief of Livsmedel i fokus.

Don't forget about cereal protein!

We are witnessing a rare situation in the food industry, with price hikes caused by uncontrollable cost increases and the media's subsequent improbable interpretations of the situation. Politics on this issue has also gone mad. Governor of the Riksbank Erik Theodén thinks we should buy the cheapest possible foodstuffs to keep down inflation, using semmel buns as an example. In general, such consumer behaviour results in increased imports and reduced Swedish self-sufficiency. So does the Riksbank think paying for better quality, and Swedish, products is not worthwhile? One of our leading politicians believes that supermarket chains should put pressure on their suppliers' prices. Why should food be both cheap and high quality, a demand we rarely place on other goods, such as perfume or cars?

I USUALLY BLAME the patriarchy. The housewife who used to (and perhaps still does?) make the food budget go further was praised by those who had the financial power. We now use only 12 to 13 per cent of our disposable income to buy food, but at the end of the 1970s this figure was 35 per cent, and we are

now below the EU average. We can start the discussion with how a quarter of this money is spent on empty calories and how we throw away one-third of our food. Good food must cost money! Invest in priceworthy, tasty and nutrient-dense food: potatoes and root vegetables, grains and dairy products as a foundation, seasonal vegetables, fruit and berries, plus reasonable amounts of meat, fish and eggs.

CEREAL PRODUCTS ARE pushed aside in the "eat green" message, which is in many ways unfortunate. Considering that people have survived at these latitudes for so many generations thanks to cereal products, they should have a more prominent role. We ate porridge and/or gruel and bread every day 150 years ago. The vital element in cereals is wholegrains, which have the strongest evidence for counteracting the most common public health issues. Protein from cereals is also important. I suggest that we add another protein to the blue from the sea, the red from meat and the green from vegetables and legumes, namely the beige protein from cereals.

☺ Ingela Stenson

Ingela Stenson



PHOTO: MATTIAS SÖDERMARK

"...the beige protein from cereals."



Ingela Stenson
trend analyst,
editor-in-chief of
Livsmedel i fokus

Want to feature in "From my perspective"?
Email us at: tidskriftenc@lantmannen.com
Cerealier is not liable for submitted materials.



↑ Current research is exploring the potential for using grass protein in feed for pigs and poultry.

Focus on protein on Foundation Day

Every year, the Lantmännen Research Foundation holds a Foundation Day. This spring it highlighted trends, research and practices in the field of protein – from cultivation to its use in animal feed, food and materials.

Helena Fredriksson, Karin Arkbåge
Lantmännen R&D

Agriculture is necessary for the production of protein. The foundation for quality is laid during growth, and we have come some way here, particularly in developing technology – essential for sustainable and efficient production. One example is the development of sensors for precision farming, so crops get the right nutrition for optimal bread quality.

IN DEVELOPING ANIMAL FEED, protein quality and the availability of essential amino acids are vital. Circularity is a focus of

research, and various side streams from fields, forests and the sea are evaluated as potential sources of protein, supplementing traditional raw ingredients.

Pasture grass is our biggest crop and a protein source full of potential. Ruminants, such as cows and sheep, utilise protein from grass, which monogastric animals such as pigs and poultry are unable to do in the same way. Using grass protein in feed for pigs and poultry has an exciting potential that is now being explored in several research projects.

THERE IS GREAT INTEREST in plant-based proteins in human food, not least as ingredients in new green foods. Research into proteins in milk and meat, and how they are used, has come a long way compared to that for plant proteins.

The properties of proteins from the plant and animal kingdoms differ significantly. For example, producing a plant-based drink with the same protein level

as milk is challenging. More knowledge is necessary if new foods based on plant proteins are to be a natural element of popular, everyday foods. Cereals and legumes contain many valuable components in addition to protein, such as starch, fat and fibre, which can also be refined and used as ingredients.

IN THE MATERIALS FIELD, research shows that processing wheat gluten can create biodegradable material with a good absorption capacity. Could the nappies of the future grow in fields?

Cereals and legumes have long been an important element in animal feed and our food, but the question is how this will look in the future. We will probably see new and improved crops and a wider range of uses. Important insights from the day were that sometimes protein quality is more important than protein level, and that there is a great need for continued research and innovation. ●

NEWS FROM LANTMÄNNEN RESEARCH FOUNDATION



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The survey is conducted in partnership with Nepa, a marketing intelligence company.



About the research foundation

Lantmännen Research Foundation supports research in the entire chain, from field to fork. It grants SEK 25 million to research annually, focusing on three areas:

- Agriculture and machinery
- Bioenergy and green materials
- Food and health

The goals of this research funding include increased agricultural production with minimised

environmental impact, and establishing how agriculture can contribute to the development of a biobased society. In the area of food, we want to increase knowledge of cereals and legumes as a natural element of sustainable future food.

The foundation's annual call opens at the end of June and closes on 2 October 2023.

www.lantmannen.com/researchfoundation

Applications are assessed on

their newsworthiness, scientific quality and business potential. Decisions are announced in December. ●

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