

Cerealier

No. 03/2025

A magazine from
Lantmännen
Research Foundation



ENERGY BUFFET

**Helping pupils
make healthy
choices**

DENMARK

**More greens
for families
with children**

RECIPE

**Bake the most
sustainable
bread**

#03

*Health benefits
from following
dietary guidelines*



THEME

**DIETARY GUIDELINES
VS REAL LIFE**



Helena Fredriksson

Harvest time

Although most people know what they should eat for good health, living by the rules isn't always easy. According to the Swedish National Food Agency, *dietary advice on wholegrains could have the greatest impact on Swedish public health*. A new feature in the most recent Swedish dietary guidelines is the inclusion of legumes. This issue, on the theme of "Dietary guidelines vs real life", highlights some Swedish and Danish initiatives to inspire people to follow the guidelines. These can vary slightly in the Nordics, although they are all based on the Nordic Nutrition Recommendations. Read more on page 5.

ALSO IN THIS ISSUE, Leif Bülow, director of ScanOats, a major Swedish research centre, talks about interesting conclusions from research into the entire oats chain – from gene and field to fork.

And we present a new Finnish doctoral thesis that focuses on the flavour challenges of faba beans.

We also want to inspire sustainable baking, with a recipe for carrot and apple bake that won the title of "Sweden's most sustainable bread", where the aim was to increase playfulness in Swedish restaurant and catering kitchens while decreasing food waste.

Time to enjoy freshly harvested ingredients!

Happy reading!

Helena Fredriksson

Lantmännen Research Foundation

"A new feature in the most recent Swedish dietary guidelines is the inclusion of legumes."



PHOTO: GOLDEN RETRIEVER

Dietary guidelines vs real life

Different strategies for getting the message across.

Pages 7–15

Cerealier

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PHOTO: LIZA SIMONSSON



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PHOTO: SCANOATS

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LANTMÄNNEN
RESEARCH FOUNDATION

Flour the way forward for increased legume consumption



In the UK, dietary advice is published in the Eatwell guide, which recommends consuming 80 grams of lentils or beans every day. In a study, researchers from the University of Reading examined how the UK population follow this advice.

By far the largest source of legumes in food was baked beans. So that more people can benefit from legumes' positive health properties, experiments have been conducted on mixing ground peas and beans into bread.

The people who ate bread that included legume flour felt fuller for longer and had more stable blood sugar than those who ate conventional white bread.

Staple foods such as bread and pasta with admixed legume flour can thus be an effective way of increasing legume consumption without excessive interference in people's eating habits, conclude the researchers. ●

Read more: Lovegrove *et al.* Pulse and legume consumption is associated with a more optimal nutrient intake and a higher EAT-Lancet index in a representative UK population. *European Journal of Nutrition*. 2025.

5.9

million tons

is this year's estimated Swedish harvest of cereals and oilseeds, according to the Swedish Board of Agriculture in August. ●



PHOTO: ISTOCK

Climate-friendly eating habits may increase iron deficiency in girls

Iron in food is difficult to absorb, making iron deficiency a common condition globally. Meat, seafood and vitamin C help the body absorb more iron from food, while phytic acid, soya protein and calcium inhibit absorption.

IN AN ARTICLE on nutritionsfakta.se, researchers from the universities of Gothenburg and Umeå state that girls who choose vegetarian or

climate-friendly diets are particularly vulnerable to developing iron deficiency. In a study of 15-year-old girls' diets over a week, only 15% had the recommended intake of iron.

WHEN THE SCHOOL meals were nutritionally analysed, they were found to contain insufficient amounts of absorbable iron to meet the girls' needs. Dishes based on soya protein had the lowest bioavailability.

The researchers show the importance of school meals containing components that promote iron absorption. One solution to iron deficiency could be to create hybrid dishes, replacing some of the meat with vegetable-based food. ●

Read more (in Swedish): nutritionsfakta.se/2025/06/17/okad-jarnbrist-hos-tonarsflickor-en-nodvandig-konsekvens-av-klimatvanliga-matvanor/

Link between low-fibre diet and dangerous vascular plaque

A major dietary study involving 24,000 people aged 50-64 has examined the link between diet and heart health.

It was led from Lund University and showed that serious conditions, such as coronary artery stenosis, were more common in people whose diet was low in

fibre, contributing to a 1.6 times higher risk of developing dangerous plaque and coronary artery blockages compared with people with healthier eating habits. ●

Read more: academic.oup.com/circovascres/article/121/8/1204/8162637

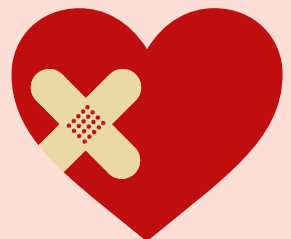




ILLUSTRATION: LENE DUE JENSEN

The same recommendations lead to differing dietary advice

For 80 years, the Nordic Nutrition Recommendations (NNR) have formed the basis for national dietary guidelines in the Nordic and Baltic countries. Since 2023, they have included the health, climate and environmental impacts of our food choices. The focus of the various countries' dietary guidelines can differ in terms of which aspects are emphasised.

In July 2024, Maijaliisa Erkkola, professor of nutrition and public health at the University of Helsinki, was invited to speak at a congress in Belfast. In preparation, she wrote a scientific article that summarised the variations in the national dietary guidelines of Nordic countries.

"I invited representatives from all the

Nordics and Estonia to participate as co-authors, because gaining insights from each country was important," says Erkkola.

IN THE FINAL PUBLICATION, the authors conclude that although all countries include both health and environmental aspects in their dietary guidelines, they are given varying weight. Denmark is where the environment has received the most attention, while Norway has not included the environment in its dietary guidelines at all, instead addressing this aspect in a separate report.

"Of course, it's a shame that Norway chose to exclude environmental aspects from their guidelines. It shows that we need to be better prepared for external influences before the next update."

In both Norway and Sweden, the advice to reduce meat consumption caused political debate.

"I was surprised that, despite the controversy and political pressure, the advice on red meat consumption ultimately corresponded with the NNR in all the countries. Denmark and Estonia chose to be even stricter in their recommendations," says Erkkola.

NATIONAL GUIDELINES also vary for legumes, with some countries specifying a recommended amount, while others do not.

Ingar Nilsson

Read more: Erkkola *et al.*: From evidence to action: implementing the Nordic Nutrition Recommendations in national policy. Cambridge University Press. 2025.



Brewing waste can become a valuable ingredient

In a doctoral thesis presented at the University of Helsinki this July, Prabin Koirala describes how technology enables the use of a brewing side stream. This side stream, which is rich in protein and fibre, has so far been difficult to use due to the dietary fibre's complex composition and structure.

In his research, Koirala used lactic acid fermentation to convert the waste into a valuable ingredient. The fermented brewery residues were then used in bread, resulting in improved texture, more moisture and a higher fibre content than in bread without this ingredient.

The studies also showed that enriched bread increased the production of specific substances in a gut model, with suggested potential health benefits. ●

Thesis: P. Koirala: Upcycling of brewers' spent grain via in situ synthesis of dextran and oligosaccharides by lactic acid bacteria. University of Helsinki. 2025.

Correction

In Cerealier 2/25, we highlighted a thesis by Hannah Ohm on the genetics of faba beans. Unfortunately, we accidentally published an illustration for the article without crediting the artist. The illustration was by Ellen Rémy. We apologise for this oversight. ●



ILLUSTRATION: LENE DUE JENSEN

Oat residues as snacks and meat analogues

The market for plant-based drinks is growing steadily, not least for soya and oat drinks, which can have positive effects on both health and the environment.

EXTENSIVE PRODUCTION also generates tons of okara, a side stream created when the drinks

are produced. In her doctoral thesis from Lund University, Amanda Helstad has investigated how protein and fibre-rich okara could be utilised as a foodstuff. She managed to extend its shelf life through high-pressure pasteurisation.

WORKING WITH a business, she has developed two products from oat okara: a meat

analogue with extruded oat okara and hemp protein, and a snack where starchy corn is supplemented by the okara. ●

Thesis: A. Helstad: Upcycling Plant-Based Beverage Residues (Okara) from Soy and Oat: Strategies for Shelf-Life Extension and Novel Food Product Development. Lund University. 2025.

Webinar focusing on sourdough

Europe's HealthFerm research initiative, which investigated the fermentation of cereals and legumes, regularly organises open webinars.

The third, to be held on 6 November, will have sourdough as its theme. The webinar will discuss sourdough microbiology, technology and sensory science, as well as how industry can use this. Participants include Christophe Courtin,

professor at KU Leuven; Luc De Vuyst, professor at Vrije Universiteit Brussel; Kati Katina, professor at the University of Helsinki; and Valery Gutsal, researcher at Novonesis. The seminar will be held from 14.00 to 15.30. ●

Read more and register here: <https://attendee.gotowebinar.com/register/5743386291592241757?source=hgf>

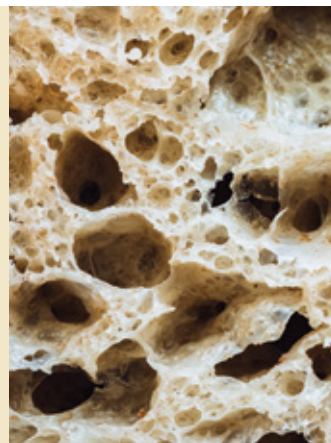


PHOTO: ISTOCK

THEME

DIETARY GUIDELINES VS REAL LIFE

The latest version of the Swedish dietary guidelines was presented in April this year. They are well supported by scientific evidence and could be extremely helpful when we choose what to eat to benefit our health. However, few people follow the guidelines – this issue provides examples of what happens when dietary guidelines encounter real life. ►

Photo Golden Retriever





Åsa Brugård Konde is a nutritionist and project manager for work on updating the dietary guidelines at the Swedish National Food Agency.

More people could live longer if dietary advice is followed

If more Swedes followed the dietary guidelines, more would likely live longer and healthier lives. One of the biggest health risks in Swedish eating habits is the low consumption of wholegrains. Changing people's eating behaviour is difficult, and less than one in ten of the population eats the recommended 90 grams of wholegrains per day.

Text Ingar Nilsson



sa Brugård Konde is a nutritionist at the Swedish National Food Agency and project manager for work on updating the dietary guidelines.

"The guidelines are based on the Nordic Nutrition Recommendations, and these are based on current global research. Our finished guidelines consider other relevant factors, such as environmental aspects and the population's eating habits," explains Brugård Konde.

THE FOOD AGENCY regularly measures compliance with dietary guidelines and notes that more people have started following them as regards fruit and vegetables, while many people consume more sugar than is healthy.

"We also do modelling to see how many

premature deaths could be avoided if more people followed the guidelines. They show that if the population's diet had a five per cent better correspondence with the dietary guidelines, it would mean around 1,200 fewer premature deaths each year. This number would rise to 4,700 if diets were 20 per cent more in line with the guidelines.

FOLLOWING THE ADVICE on nuts, seeds, vegetables, fruit and wholegrains would have the greatest impact on Swedish public health. This year, legumes had a separate recommendation: we should eat them every day, because they are good for both our health and the environment. Brugård Konde points to the Global Burden of Disease study, conducted by the Institute for Health Metrics and Evaluation at Seattle University, which identifies the greatest public health risks in different countries.

INCREASING THE PROPORTION OF DIETARY WHOLEGRAINS

- 4 slices crispbread = 48 grams wholegrains
- 1 portion wholegrain pasta = 40 grams wholegrains
- 1 portion oat porridge = 35 grams wholegrains
- 2 slices wholegrain bread = 40 grams wholegrains

SOURCE: THE SWEDISH NATIONAL FOOD AGENCY'S DIETARY GUIDELINES FOR ADULTS

"They look at both lifestyle and diet, finding that – among eating habits – Swedes' low intake of whole grains poses the greatest risk of premature death," she says. Eating wholegrain bread with hummus every day could be a good way of creating new, healthier habits, she advises.

Dietary guidelines change when research reaches a new consensus; the advice on limiting red meat and charcuterie was introduced in 2014, when the guidelines first took environmental aspects into account.

WHEN THE LATEST update to the dietary guidelines for adults was presented this spring, extensive communication efforts were made to disseminate them to the public and stakeholders via the press and social media. The Swedish Food Agency also places great emphasis on outreach work to people and organisations that can pass on the advice to others. The food industry is a key partner, as is the healthcare sector.

"We have developed visual aids that can be used when discussing health issues," says Brugård Konde. "The Food Agency's website also has suggestions on how to implement the dietary guidelines in everyday life. We try to avoid being too didactic; instead, we want to provide motivation and inspiration." ●

Tool helps to make school lunches more nutritious

SkolmatSverige (School Food Sweden) has been helping schools and municipalities make school lunches more nutritious and sustainable since 2012. This web-based survey tool enables them to evaluate and improve the quality of school meals. The initiative is now shifting from a national focus to a regional one, specifically schools in the Stockholm County.

Text Ylva Carlsson

SkolmatSverige is run by Region Stockholm's centre for epidemiology and social medicine. "School meals have a unique potential for promoting equitable dietary habits among children and teenagers," says Josefin Lindroth, project manager for SkolmatSverige.

On a normal day, almost 1.4 million school meals are served in Sweden. The annual cost for meals in compulsory schools amounts to more than SEK 5 billion, which exceeds the spending on teaching materials and school libraries.

School lunches have a crucial role in young people's nutritional intake. Lunch contributes about half of their daily vegetable intake and has a higher nutrient density than the rest of the day's meals.

ABOUT HALF OF SWEDEN'S approximately 4,800 compulsory schools have used the SkolmatSverige's service. The tool consists of several questionnaires that assess different aspects of quality and provide schools with automatic feedback once the responses have been submitted.

"Including school meals and the meal environment's healthy and sustainable aspects in systematic work on quality assurance is important for student health and for climate impact, in both the short and long term," says Lindroth.

PHOTO: LIZA SIMONSSON



Josefin Lindroth
Project Manager SkolmatSverige

The meals' nutritional quality is assessed using the levels of four particularly important nutrients: iron, fibre, vitamin D and fat. Researchers at Karolinska Institutet have evaluated the tool based on changes in meals' nutritional quality over a seven-year period. The evaluations started in 2011, after the introduction of a legal requirement for nutritious school meals.

THE RESULTS SHOW clear improvements. The proportion of primary schools that succeeded in meeting all four nutritional criteria increased from 11% in the school year 2012/13 to 34% in 2018/19. The effect was greater when assessments were sent to users, emphasising the importance of active feedback.

"The studies show that schools that used the tool several times were more

"School meals have a unique potential for promoting equitable dietary habits among children and teenagers."

PHOTO: LIZA SIMONSSON



Ulla N Lindberg
Kitchen Manager Trollboda School

"We have assessed and improved school meals using SkolmatSverige for years."

likely to fulfil the requirement for nutritious meals. Repeated use of the tool has also enabled schools to set long-term goals," says Liselotte Schäfer Elinder, officer at the centre for epidemiology and social medicine and professor of public health sciences at Karolinska Institutet.

Trollboda School in Hässelby-Vällingby is one of many schools that have used the SkolmatSverige's service to promote good eating habits. The school has its own catering kitchen and works actively to ensure that the food it serves is tasty, appealing and healthy.

Ulla N Lindberg is the kitchen manager at Trollboda and emphasises the importance of school meals for students having a good day at school and for their future health:

"We have assessed and improved school meals using SkolmatSverige for years, something that all schools in the City of Stockholm must do annually."

TROLLBODA IS ALSO working on environmental sustainability by developing what it offers, reducing food waste and increasing the amount of organic food on the menu.

SkolmatSverige has received no national funding since this July; it now has a regional focus and offers support to schools and municipalities in Stockholm County. A needs analysis is currently being conducted to clarify the kind of support they want. The results serve as a foundation for developing future support and the website. ●

SKOLMATSVÉRIGE

Founded in 2012 by researchers at Karolinska Institutet and Region Stockholm, in collaboration with Sweden's National Food Agency, Public Health Agency, Board of Agriculture, Association of Local Authorities and Regions, and National Agency for Education.

PHOTO: ISTOCK

How the survey tool works

1

Evaluation
(web survey)

2

Guidance
(results report)

3

Dialogue
& cooperation

4

Measures
& management





PHOTO: KARLSTADS KOMMUN

Energy buffet guides pupils

By reducing food waste, healthy options such as fruit, vegetables and wholegrains can fill the plates in school canteens. This is one of the main conclusions of a recent project: "Ett nytt recept för skolmåltider" (A new recipe for school meals).

Text Ylva Carlsson

Imagine a canteen in an average Swedish school. Large spaces, white walls and loud noise. Every day, many school children opt out of this unruly lunch environment and buy something to eat in nearby cafés or shops.

"It is a huge problem. If school canteens are to become the safe and pleasant surroundings we want them to be, then we need to involve the pupils more," says Emelie Elin from the Swedish

National Food Agency, one of the leaders of "A new recipe for school meals".

IN THE PROJECT, public authorities have worked together to identify and understand how different factors converge to influence school meals; one finding was that, in some cases, knowledge about sustainable food is lacking within the school organisation.

"Whole grains and cereals are perfect as a base for much of what is served."

Linnea Olsson Lee
Head of Food and Nutrition, Karlstad Municipality

Four pilot municipalities participated in the project, and pupils and staff worked closely on developing nine approaches. These were then tested in a real-world environment. One of the municipalities was Karlstad, which focused on the school canteen's design.

LINNEA OLSSON LEE, head of food and nutrition for Karlstad Municipality, says that the pupils were quick to express their wish for a canteen that feels welcoming, "like a real restaurant". With modest means, the canteen was remodelled – from a large open space to small enclosed areas. The walls were repainted in muted, calming colours.

To offer more sustainable meal options, the school introduced an energy buffet, which was served in the morning and after lunch.



PHOTO: KARLSTADS KOMMUN



PHOTO: ISELIN SUNDBERG / KARLSTADS KOMMUN

← Linnea Olsson Lee, Head of Food and Nutrition, Karlstad Municipality.



PHOTO: JEANETTE HÄGGELUND / LIVSMEDELSVERKET

← Emelie Elin led the project "Ett nytt recept för skolmåltider".

←← Three schools in Karlstad have offered an energy-rich buffet, including juice shots, overnight oats and seed crackers.

to new and healthy choices

"We know that some children don't eat breakfast at home, so this was a way to get them to come to the canteen in the morning and rouse their interest in trying something new," says Olsson Lee.

The buffet consisted of food that the school received for free from shops, mainly fruit and vegetables that would

otherwise be wasted. The buffet often also included seed crackers, overnight oats and porridge.

"Wholegrains and cereals are perfect as a base for much of what is served," says Olsson Lee.

AT THE NATIONAL FOOD AGENCY, Elin is pleased that the project has resulted in concrete solutions that have helped to reduce food waste, and that pupils' interest and participation in school meals have increased.

"By offering an energy buffet to pupils while reducing food waste, the school creates a win-win situation. The buffet also helps to shape good eating habits by, for example, increasing wholegrain intake."

The concept has been introduced in three of the municipality's schools and, when new schools are planned, the previous requests for a more welcoming

eating environment and healthier food are considered.

Olsson Lee would like to encourage more schools, like those in Karlstad, to get pupils curious about healthy alternatives. Her top tip is to start small.

"A lot can be changed with modest means. Create a small group that includes several staff categories and that involves the pupils from the beginning. The cooks don't have to do everything, as many pupils want to help in the kitchen." ●

Karlstad Municipality's work on developing food environments is described in *Kokbok för måltidsmiljön* – a recipe book for the environment. It can be downloaded from the National Food Agency's website (in Swedish): <https://www.livsmedelsverket.se/om-oss/publikationer/handbocker-och-verktyg/kokbok-for-maltidsmiljon/>

PART OF A LARGER INITIATIVE

"Ett nytt recept för skolmåltider" started in 2019 and ended in 2025. The project was part of a larger initiative on food and sustainability, based on the Global Goals in the 2030 Agenda for Sustainable Development. The municipalities of Hofors, Karlstad, Munkedal and Vallentuna participated. The initiative was funded by Vinnova and coordinated by the Swedish National Food Agency. The project has ended, but the results continue to be disseminated.



DENMARK MOBILISING TO EAT MORE GREENS

Based on Denmark's dietary guidelines, a project called "Smag dig frem – gør Danmark grønnere" (taste your way – make Denmark greener) hopes to make the country's food culture healthier and more sustainable. The target group is 500,000 families with young children, who will get help to eat more vegetables.

Text Ingar Nilsson

For a year, Siliane Bjerre, programme manager for the Madkulturen (food culture) initiative, has worked closely with the Tænk consumer organisation, the Danish Broadcasting Corporation and the Danish Veterinary and Food Administration, bringing the various elements of the project together. This includes programmes on Danish TV and radio, skills development and activities in grocery stores.

IN ADDITION, three Danish cities have partnered in pilot workshops, where local families will encounter the project in schools, associations, their neighbourhoods and special cooking activities. Researchers from the Department of Food and Resource Economics at the University of Copenhagen will study the participants' experiences.

"Our surveys show that Danes are spending less time cooking and that children are less involved in the kitchen than ten years ago. There are also fewer shared mealtimes, and more people are eating in front of a screen. We can see a slight increase in families using legumes, but we also know that when you become

PHOTO: INGAR NILSSON



Siliane Bjerre
Programme Manager at Madkulturen

"The message should focus on what there should be more of in someone's diet..."

a parent, most people tend to return to the food they had as a child, which often lacks vegetables."

BJERRE EMPHASISES the project's focus on inspiration; it is not intended to make struggling parents feel guilty. The message should focus on what there should be more of in someone's diet, not on banning meat. The participating municipalities each have a project manager, staff in the local neighbourhoods and local steering committees.

SMAG DIG FREM – GØR DANMARK GRØNNERE

The programme runs 2025–2027 and is funded by the Novo Nordisk Foundation and Nordea Foundation. The initiative is run by Madkulturen, an independent organisation for knowledge and change, which is part of the Danish Ministry of Food, Agriculture and Fisheries. Other partners are the Danish Veterinary and Food Administration, Tænk consumer organisation, and the Danish Broadcasting Corporation, as well as the municipalities of Slagelse, Kolding and Svendborg.

"We will boost the activities and associations that are already in the municipality and which involve families with children," she says. These include annual town festivals, food and nutrition classes in schools and the children's extracurricular activities.

When families turn on the TV or radio, they should be able to tune into programmes about greener food and send in suggestions for Denmark's next favourite green dish. And, on social media, the message is further reinforced.

THE FOOD ADMINISTRATION sees the project as an opportunity to get closer to reality and increase knowledge of what can change Danes' eating habits.

"There is a climate dimension in our dietary guidelines, *Denmark's Official Dietary Guidelines – good for health and climate*. This means focusing on eating less meat and more legumes," says Simon Rask, head of the section for food, sustainability and health. "We already work with both these areas, and this project is giving us the chance to refine our knowledge of what works when we try to help professional catering kitchens to make changes, for example."

As part of the project, his team will ensure that canteens in schools and workplaces get new methods and recipes. Dietary guidelines will be translated into meals, and purchases will be discussed to help create more flavourful vegetable-based food.

"What we want to work towards is normalising a diet with plenty of vegetables and legumes," Rask concludes. ●

Read more (in Danish): www.madkulturen.dk/viden/

Future oats: from gene and field to fork

New oat varieties, new product concepts and fewer side streams. These are a few results from ScanOats' multi-year research programme, which ends in 2026.

Text Åsa Eckerrot

The ScanOats industrial research centre began work on developing the oats of the future in 2017. There is a natural reason for this major investment in developing new Swedish oat varieties and products, says Leif Bülow, professor of applied biochemistry at Lund University and the centre's director.

"The Nordic climate and soils are excellent for growing very high-quality oats. Oats are also important from the perspective of civil preparedness, as they are easier to grow than wheat, for example, and can be grown in less demanding soils."

SCANOATS' ACTIVITIES ARE comprehensive, and its work goes "from gene and field to fork," as Bülow expresses it.

"Genetic research is how we develop new

varieties and new traits. We were the first in the world to publish the entire oat genome and have started to link oat traits to it, such as beta-glucan synthesis and plant oil."

Large-scale field trials have been conducted as part of the project. Soil type, seeds and sowing, fertiliser use and harvesting have been studied and cultivation instructions developed.

"We have also developed new oat varieties that have been grown in both Sweden and New Zealand, resulting in two harvests per year."

BÜLOW ALSO HIGHLIGHTS how ScanOats, by addressing fundamental academic problems and more industrial ones, has helped bring academia and business closer. Work is continuing through this year and will conclude in 2026.

"Now, in our final year, we will capitalise on the results, including trying to start industrial

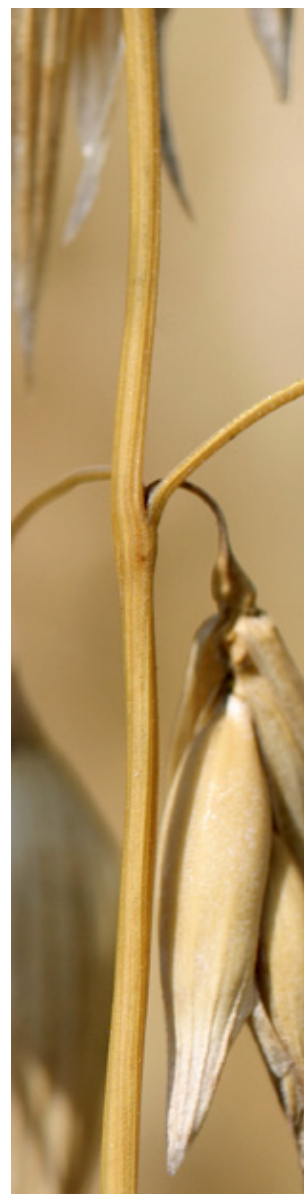


PHOTO: SCANOATS

"Genetic research is how we develop new varieties and new traits."

Leif Bülow Professor,
Lund University



activities where we mainly cooperate with Oatly and Lantmännen,” says Bülow.

Changing the amount of beta-glucan in different oat products is something that could

SCANOATS

ScanOats is an industrial research centre affiliated with Lund University.

Its main funder is the Swedish Foundation for Strategic Research. Industrial participants have been Oatly, Givaudan and Lantmännen.

Activities started in 2017 and will end in 2026. Six doctoral students and seven researchers have worked on the project. So far, 50 articles have been published, and more are in the pipeline.

Several patent applications have been submitted, and three companies have been formed. One example is Emulsi Biotech, which works with oat lipids.

be developed further. Other projects focus on reducing side streams in industrial flows and on developing the next generation of oat bread.

“Another dream is to make cheese analogues from oats. We’re not quite there yet, but we want to test new angles and develop new flavours.”

ACCORDING TO BÜLOW, from an international perspective, Sweden is very good at oats.

“We are at the forefront of research into cultivation and breeding and are probably oat world champions!” ●

Read more: Norlander et al. Effect of kilning on the macronutrient composition profile of three Swedish oat varieties. *Cereal Chemistry*. 2024.
<https://scanoats.se/>

↑ The Nordic climate is excellent for growing oats.



Carrot and apple leftovers in the most sustainable bread

“Sweden’s most sustainable bread” is Lantmännen Cerealia’s annual competition for publicly run catering kitchens. It aims to help increase playfulness in Swedish restaurant and catering kitchens and to reduce food waste. This year, 45 catering kitchens took on the challenge of creating a bread that is both climate-friendly and delicious. The winners work for Karlstad Municipality – their bread made from fruit and vegetable scraps was the jury’s favourite.

Text Ingar Nilsson

Since it started in 2021, the number of entries to the competition for Sweden’s most sustainable bread has steadily increased. This year, the jury also chose to recognise two recipes that were particularly interesting in terms of civil preparedness: a crispbread that can be stored for a long time, and a skillet bread that can be baked over an open fire.

“Chefs in schools and preschools are

most active in the competition. We want to encourage them to use our products in a more sustainable way, through being creative and utilising common food waste, such as leftover salad, porridge from breakfast, cold pasta or black pudding,” say Margareta Tedenbäck and Eva-Lena Lindqvist, who are responsible for the public sector at Lantmännen Cerealia.

THEY ARE THE ONES who select and test bake the eight recipes that make it to the final. The ingredients in this year’s entries included macaroni in white sauce and various soups. “One of this year’s finalists had used leftover black pudding in their entry and called it vampire bread,” says Lindqvist. Other finalists included naan bread made from leftover lentil stew, root vegetable bread and pumpkin crispbread.

“In the jury, we analyse the taste, aroma and texture of the bread, how the recipes are structured, the work method and the dough’s characteristics,” says Tedenbäck.

The winner had created a recipe that included fruit pulp from a breakfast smoothie, making it extra moist and delicious.

The breads are also presented at Lantmännen’s office, where staff do taste tests and vote for their favourite. This year, 200 votes came in that way, and they are weighed in with the competition’s other parameters. ●

Bake juicy carrot and apple bread with cinnamon. Recipe on the next page.

JURY CITATION

With an innovative blend of juicy apples, spicy cinnamon and sweet carrots, the winner has not only created a bread that tastes amazing but also taken clear responsibility for the future. By using leftovers from the salad buffet and stopping fruit and root vegetables from going to waste, the winner shows that sustainability and food waste reduction can go hand in hand with flavour and creativity. This is a fine example of circular thinking in the professional kitchen.

RECIPE

Bake a true winner

The winner of Sweden's most sustainable bread, 2025.

Recipe Helene Andersson & Annica Fjällman, Karlstad Municipality

Juicy carrot and apple bake with cinnamon

Makes: One baking tray

Time: 40–45 minutes

400 ml flour
200 ml rolled oats
1 pinch of salt
2 tsp baking powder
1 tbsp cinnamon
50 ml sugar

400 ml finely grated carrot, apple or
the leftovers from juice making
150 ml cooking oil
200 ml natural yoghurt
2 eggs

INSTRUCTIONS

1. Put all the ingredients in a bowl and whisk into a batter.
2. Pour the batter into a baking tray lined with baking paper and smooth the surface.
3. Bake in the oven at 175–180°C for 25–30 minutes. ●



*So far, research in precision nutrition has largely focused on individual biomarkers and their use in diet optimisation. This year's **Precision Nutrition Forum** in June took a step towards a more holistic concept, one that includes biological, societal and cultural aspects, as well as sustainability.*

Text Ingar Nilsson **Illustration** Lene Due Jensen



A holistic approach is the future of precision nutrition

Precision nutrition now recognises the need to tailor diets to a broad spectrum of individual biological and sociocultural characteristics. Another exciting area is personalised nutrition for patients taking specific medications, especially since the introduction of new anti-obesity drugs.

"We believe that the way forward is to design diets that can complement medicine and increase patient benefit," says Clemens Wittenbecher, a senior lecturer in precision medicine and diagnostics at the Department of Life Sciences at

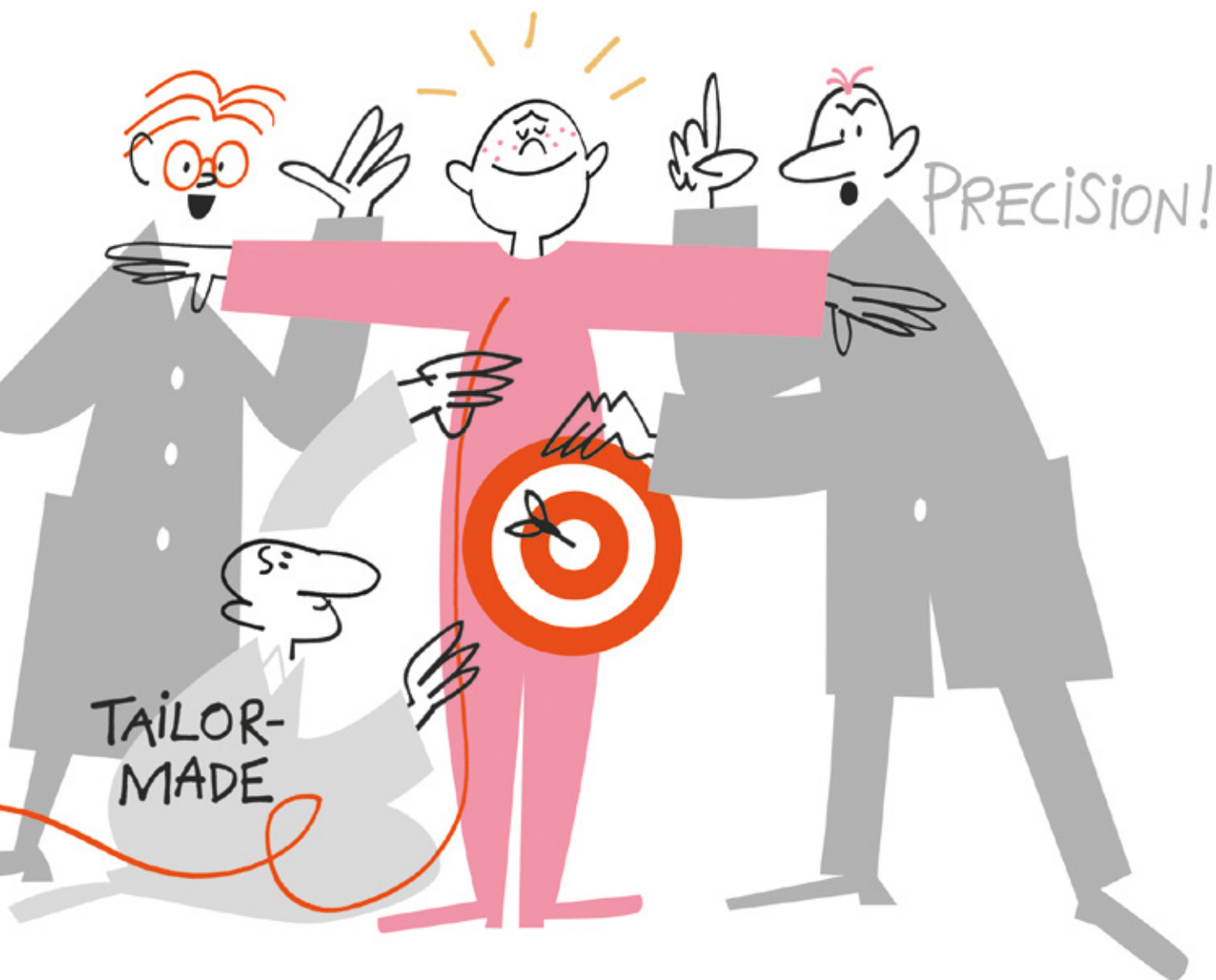
Chalmers University of Technology, and one of the organisers of the symposium held at Harvard, Boston, US. Several small studies have already shown that lifestyle changes alongside medication are more effective than just medication.

THE TOPIC WAS discussed by a panel of world-leading researchers in nutrition and obesity. Walter C. Willett, a physician and nutrition researcher at Harvard, emphasised that addressing the societal causes of the obesity epidemic is necessary to improve public health. Fatima Cody Stanford, a paediatrician

and obesity specialist at Massachusetts General Hospital, stressed the need for drug treatment to alleviate the suffering caused by obesity, especially among young people who need immediate help.

"Tailored combinations of diet and medication could balance these positions, paving the way towards effective and sustainable treatment for obesity," says Wittenbecher.

IMPORTANT PROGRESS IN precision nutrition research that was presented in Boston is that data from a number of large studies – both observational and interventional – are now available.



"One good example is the All-of-Us cohort. These data can be used by researchers globally," says Wittenbecher. "We also have access to better data for profiling the gut microbiome, which will help us better understand the relationship between diet, gut microbiome and health and disease."

THE FORUM ALSO discussed the role of new digital technologies and AI in precision nutrition research.

"From the outset, our field has adapted AI-driven modelling techniques for tailored diets, but we must be better

at understanding what the algorithms actually do. In addition, data streams from digital devices like smartwatches are often disordered, so we need to understand how to extract the relevant information for use in improved dietary advice," says Wittenbecher.

ONE DAY OF THE SYMPOSIUM was mostly devoted to the Mediterranean diet. In a major study with over 7,000 participants, Harvard researchers are collaborating with a Spanish research group to investigate how this diet can prevent diabetes and cardiovascular disease. Participants

in the PREDIMED-Plus study either eat a calorie-restricted Mediterranean diet and are encouraged to engage in physical activity, or unrestricted amounts of the same diet. Researchers measure the effects by checking the prevalence of both diabetes and cardiovascular disease among participants.

"We use biomarker studies to show the metabolic impact of the Mediterranean diet and its typical foods. This can help us to transfer insights from the PREDIMED-Plus study to other regional diets, such as the Nordic one," Wittenbecher concludes. ●



Bitterness slows faba bean progress

Protein-rich and climate-smart – yet rejected by consumers. A new doctoral thesis examines what is needed for more people to choose faba beans.

Text Ebba Arnborg

Faba beans, aka field beans, have been identified as a key crop in the transition to a more plant-based diet. They are nutritious and high in protein, and can replace imported soya and be grown without fertilisers in the Nordic climate. And yet they are glaringly absent in our cuisine. In his doctoral thesis at the University of Helsinki, Fabio Tuccillo has analysed what is preventing progress.

“Faba beans’ versatility makes them an exciting candidate for innovation in plant-based foods,” he says.

IN HIS STUDY, 264 people were asked to rate four industrially produced bean ingredients – one flour, one protein isolate that contains 90 per cent protein,



PHOTO: LUGIA TULLIO

and two protein concentrates, which contain a smaller amount of protein. The results were clear: the average scores for aroma, taste and overall impression were all in the lower half of the scale. Willingness to use these ingredients in everyday cooking averaged between one and two on a five-point scale.

BITTERNESS STOOD OUT as the clearest reason for this disinterest, with astringency and texture also contributing.

“I was surprised by how unpopular the ingredients were, regardless of the participants’ attitude towards sustainability or plant-based diets. It shows that even highly motivated consumers will not accept products unless

“It shows that even highly motivated consumers will not accept products unless the flavour is right.”

Fabio Tuccillo
Doctoral student at the University of Helsinki

↑ Faba bean.

↖ Fabio Tuccillo defending his thesis at the University of Helsinki.

PHOTO: ISTOCK

the flavour is right,” says Tuccillo. Chemical analyses were also performed as part of the study, linking certain substances to specific flavours – including vicine, convicine, phenols and amino acids that tasted bitter and had an astringent mouthfeel. The study also showed that extrusion, a process often used when producing meat substitutes, did not necessarily eliminate unwanted flavour characteristics. The bitter flavour was particularly difficult to remove completely.

“This highlights the importance of dealing with problems at the ingredient level,” says Tuccillo.

HE SAYS THE PATH to more appealing faba bean products is through improved processing lines, refined processing methods and formulation strategies that minimise off-flavours. He calls for more interdisciplinary research that includes sensory science, chemistry, plant breeding and food processing to understand which substances cause off-flavours, and how to reduce or mask them.

“Linking science and product development is crucial for successful plant-based innovation,” Tuccillo concludes. ●

Thesis: Fabio Tuccillo: On the flavor of faba bean ingredients: Consumer acceptance, sensory perception, food application, and identification of potential flavor compounds. University of Helsinki. 2025.

HOW THE FABA BEANS WERE ASSESSED



When the four field bean ingredients were tested by 264 people, the average overall rating was 4 on a nine-point scale. The median value of the ingredients was: 4-5 for aroma, 2.5-4 for flavour, 2.5-4 for overall impression. Willingness to use the ingredients, measured on a scale from 1 to 5, was 1-2.



PHOTO: GUSTAF KUMLIN / LANTMÄNNEN

↑ Lantmännen Research Foundation funds projects that link academia and practice.

New technology driving future agriculture

Agriculture faces major challenges, with the need to adapt to a changing climate and demands for sustainable growth in productivity. However, research and new technologies are opening the door to solutions.

Text Anders Lindgren, Lantmännen R&D

Farmers have access to a range of technological aids: GPS-controlled machines, drones and satellite data allow inputs, such as fertiliser and plant protection, to be adjusted to the field's variations. Decision support systems help in the analysis of field data and weather forecasts to provide recommendations or even guide real-time interventions.

THE MACHINES AND SENSORS used in agriculture produce large amounts of data that require AI models to translate them into useful information.

In the future, driverless machines will

be able to do more of the tillage work, and AI will automate increasingly sophisticated decision-making. All actions taken in the field will thus be optimised and adapted to each individual square metre. In addition to technology in the field, digital tools for planning work on the farm will bring significant gains in time and efficiency.

Rapid developments in plant breeding are also underway. Effective genomic tools allow researchers to identify traits that increase resistance to drought, disease and climate stress – traits that, together with high and stable yields, will create the varieties of the future.

RESEARCH, INDUSTRY AND end users must collaborate if these technologies are to be of practical use, which is where Lantmännen Research Foundation plays an important role. By funding projects at the interface between academia and application, the foundation can help with the testing, evaluation and implementation of new technologies in real farming systems.

For example, the foundation has contributed to developments in precision agriculture, leading to more efficient nitrogen fertilisation for optimal harvest and protein content in winter wheat and malting barley. Other funded projects include evaluating autonomous field machines and digitalising crop production. A project is currently being funded to better predict harvest levels in winter wheat, which is crucial for accurate fertiliser management. Forage production is also an important area, where work is now underway to increase the precision of fertiliser use. On this topic, another interesting project involves using dogs to find troublesome weeds. In plant breeding and seed production, the use of drones and advanced AI models to create robust varieties and better seed quality is being studied.

WHAT WE ARE EXPLORING, testing and developing today will contribute to tomorrow's innovations that can help tackle the challenges we are facing. ●

NEWS FROM LANTMÄNNEN RESEARCH FOUNDATION



PHOTO: FOOD & FRIENDS / LANTMÄNNEN

↑ The protein's structure and function are important components if you want to make food from pea protein. For example, a smoothie must have the right mouthfeel.

Recently granted projects



Protein for good mouthfeel

A project at the University of Copenhagen will investigate the relationship between the structure of pea proteins and their function. This is important for producing foods with the desired properties, for example, if the protein is to provide "bite" in a meat analogue, smooth mouthfeel in a smoothie or the right texture in a yoghurt analogue. ●



Drought-resistant forage

Access to the right amount of water is a problem for crop production. Researchers at the Swedish University of Agricultural Sciences will study how plant breeding can be used to develop plant material suitable for irrigation or drought. The results will contribute to more robust forage crops. ●



Bioplastic from starch

Researchers at RISE and Chalmers University of Technology will investigate the potential to create bio-based plastic film from wheat and pea starches. For example, the project will evaluate the films' strength and water resistance. Possible applications are growing films for vegetables and bio-based plastic packaging. ●

About the research foundation

Lantmännen Research Foundation supports research in the entire chain, from field to fork. It grants up to 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 grains and legumes as a natural element of healthy and sustainable future food.

The foundation has an open call for proposals every year. Applications are assessed on their newsworthiness, scientific quality and business potential. ●

See: www.lantmannen.com/researchfoundation

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