

Cerealier

No. 01/2023

A magazine from
Lantmännen
Research Foundation



RESEARCH

**Developing
products for
older people**

REPORT

**Benefits of
wholegrains
confirmed**

CEREAL SCHOOL

**How much
cereal is
grown
globally?**



THEME

SENSORY SCIENCE



Helena Fredriksson
A taste of spring

The theme for this year's first Cerealier is sensory science, an important field of research and full of potential for anyone who works with food. The best meals are often a combination that stimulates all the senses, where the entire experience is in focus, not just the food. Finnish researchers are studying this and much more at Flavoria, a multisensorial cafeteria that we write about here.

NEW FOR THIS YEAR is our cereal school. We start with the fundamentals, by looking at eight types of cereal and where they are cultivated. In upcoming issues we will cover their characteristics, nutritional content and areas of use.

You can read about new investments by the Lantmännen Research Foundation on page 23. I also want to draw attention to our reader survey (only in Swedish) – our editorial board works continuously to develop the magazine, and now we want your help. There is a link to an online survey on the last page.

And, to round off, there is a recipe for a filling quiche made with freshly picked nettles and wholegrain flour. A sure sign of spring, it tastes best when you've harvested the nettles yourself!

I hope you all enjoy reading this issue,
Helena Fredriksson
Lantmännen Research Foundation

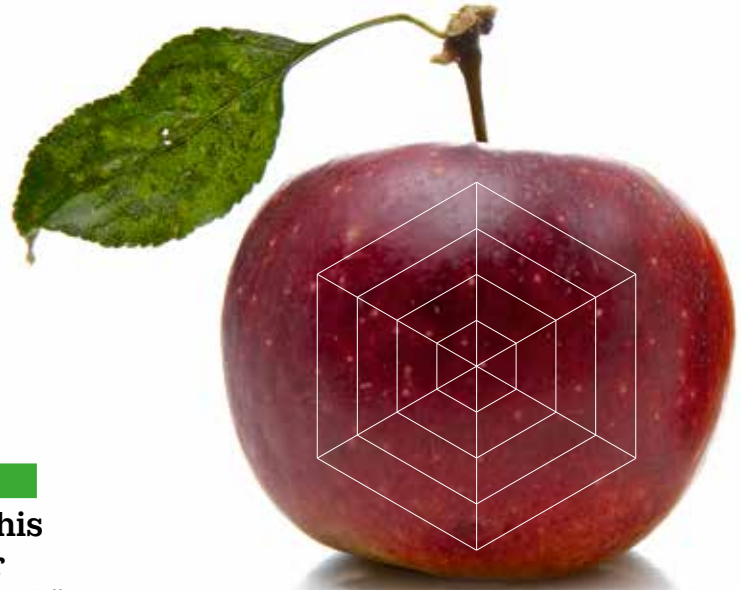


PHOTO: ADOBE STOCK

“New for this year is our cereal school.”

Sensory science

This issue examines the research in the field of sensory science and sensory analysis, an important tool when developing new foods.

Pages 7–15

Cerealier

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PHOTO: ISTOCK

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Cerealier is published by Lantmännen on behalf of Lantmännen Research Foundation. Its aims to increase awareness about cereals (grains) and legumes, based on current research and debates on nutrition.



LANTMÄNNEN
RESEARCH FOUNDATION

White paper on alternative proteins



The European food cooperation, EIT Food, has released a white paper

on protein diversification, including sources from plants, algae, insects and cultivated meat.

It examines recent innovation and critical factors in the production of more alternative proteins for consumers. Researchers from several Nordic universities worked on the white paper. ●

Read more: www.eitfood.eu

25

million Swedish kronor was invested in research by Lantmännen Research Foundation in 2022. ●

New report on processing

The editor-in-chief of Örebro University's *nutritionsfakta.se*, along with researchers from other Swedish universities, has compiled a factual report on processing and ultra-processed foods.

Its focus is the current classification system, health effects and how processing affects nutritional content and bioavailability.

It will be published on nutritionsfakta.se in April, and a seminar will be organised in the spring. ●

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



PHOTO: TOMMY ALSÉN / ISTOCK

↑ Knowledge hub to boost Sweden's animal-based food production.

Knowledge hub for Swedish animal-based food production

The Swedish Board of Agriculture has tasked the RISE research institute with starting a knowledge hub

to increase the competitiveness of Sweden's production of animal-based food. The Government has allocated it SEK 100 million, over 2023–2027. This investment

is part of the Food Strategy's objective of a sustainable and competitive food chain. ●

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

PHOTO: LEONORI / ISTOCK



Investing in health through food

Vinnova's project to create "a new recipe for the food system" has five focus areas, one of which is preventive health through food. In 2023, Livsmedelsakademin will lead work on creating a long-term innovation environment for dietary impact on health, along with several universities and public stakeholders. The vision is to make food and health natural elements of preventive healthcare. ●

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

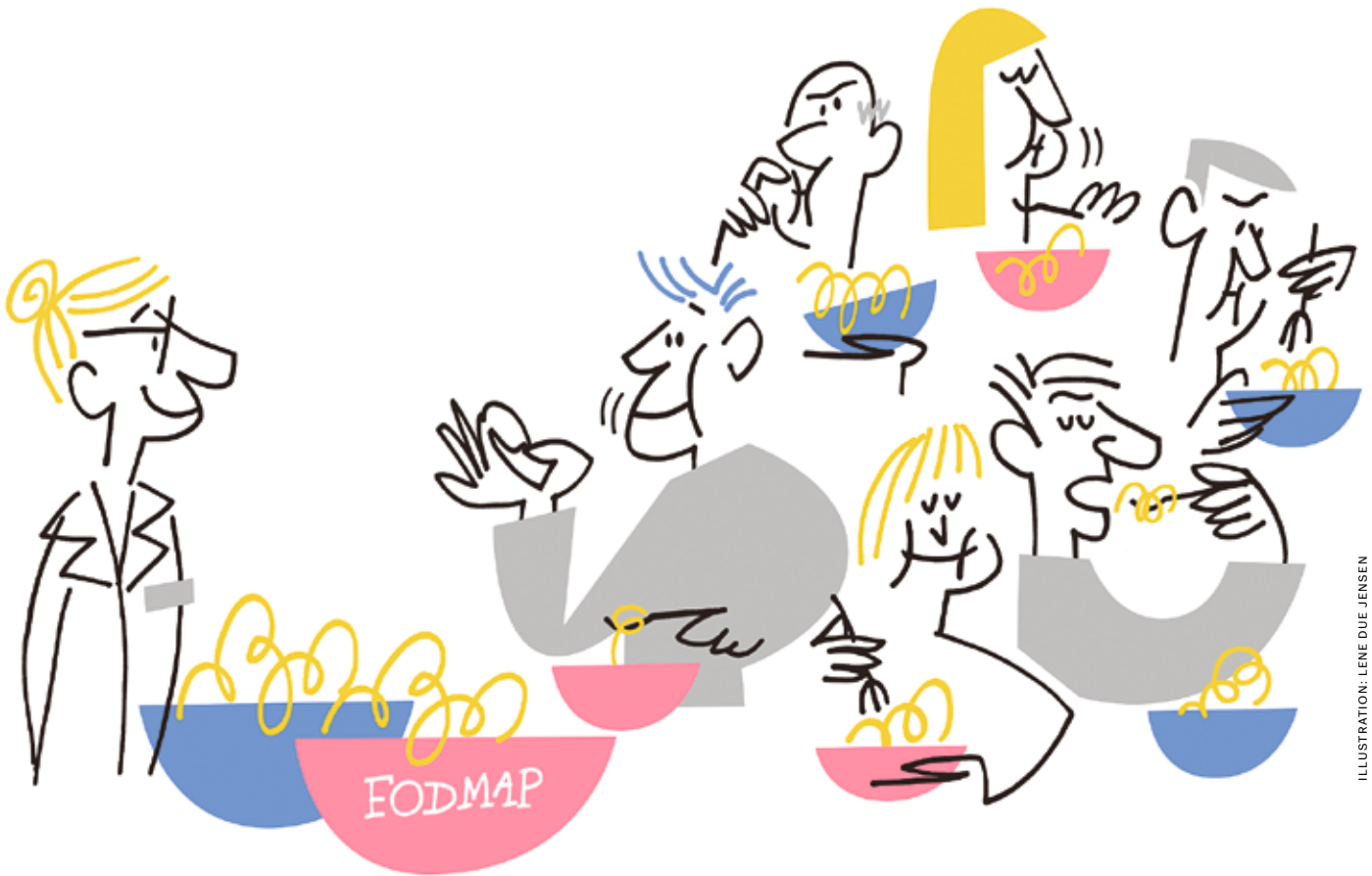


ILLUSTRATION: LENE DUE JENSEN

Mild IBS symptoms from FODMAPs

A recent doctoral thesis from Chalmers University of Technology demonstrates that a group of carbohydrates, FODMAPs, only produce mild symptoms in IBS patients and may have a beneficial effect on gut bacteria and gut health.

Someone with irritable bowel syndrome (IBS), has problems that stem from their bowel. It often functions irregularly, with constipation or diarrhoea, which sometimes alternate. The causes of IBS are unknown, but one theory is that the interaction between the gut and the brain does not function properly. There is currently no effective treatment for IBS, but symptoms can be lessened through an adapted diet, according to Elise Nordin, who

recently earned her PhD from Chalmers with a thesis on the effects of FODMAPs and gluten on IBS.

TO EVALUATE THE EFFECT of high levels of gluten and FODMAPs' intake on IBS symptoms, Nordin conducted a double-blind and placebo-controlled study with 110 participants. She also analysed gut bacteria and the metabolites (metabolic products) in their blood.

FODMAPS

FODMAPs is the abbreviation for fermentable oligosaccharides, disaccharides, monosaccharides, and polyols, which are different types of carbohydrates. Dietary advice for IBS patients often entails excluding foods that contain FODMAPs and gluten.

"We showed that intakes of gluten and FODMAPs caused a mild increase in symptoms, or none at all. However, after the intake of FODMAPs, gut bacteria and metabolites changed in a way that was beneficial to health."

THE POSITIVE CHANGE was specifically linked to reduced inflammation and a lower risk of type 2 diabetes. The researcher's conclusion is that limiting the intake of FODMAPs in people with IBS must be weighed against the health benefits of a diet that includes FODMAPs.

Åsa Eckerrot

Footnote: There is a longer interview with Elise Nordin in Cerealier no. 3, 2021 (in Swedish). Ref. Nordin, doctoral thesis, Chalmers University of Technology, Sweden, 2023.

Call for PhD project proposals



This spring Swedish Farmers' Foundation for Agricultural Re-

search is announcing funding for four doctoral studentships to advance expertise in primary production. Two of the projects must focus on the gardening sector and integrated plant protection, while the other two have no specific demands for specialisation.

Up to SEK 2.5 million can be applied for per project. ●

Read more: <https://www.lantbruksforskning.se/english/research/>

New and greener "food circle"



PHOTO: LIVSMEDELSVERKET

The Swedish Food Agency has developed a greener version of its "food circle", a model that contains seven food groups with different nutritional contents. Eating something from all parts of the food circle every day makes it easier to consume all the necessary nutrients.

The new and greener food circle now has more space for plant-based alternatives and has been supplemented with plant-based drinks, nuts and seeds. Legumes have a more prominent role than previously, as they fit into several food groups. ●

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



ILLUSTRATION: LENE DUE JENSEN

New wheat withstands drought

The international Crop Trust's cultivation programme has developed a new durum wheat, which is able to cope with drought conditions.

It was developed in partnership with farmers, by crossing wild lines of durum wheat with modern varieties. The wheat has been named Jabal, which means mountain in Arabic.

It is expected to be available to farmers in Morocco in just over three years. ●

Read more: <https://www.croptrust.org/news-events/campaigns/jabal-durum-wheat-variety/>

Sensory science symposium in Sweden



On 15–16 May 2023, the European Sensory Science Society will hold a symposium on sensory food science at Uppsala University. Speakers from academia and business will present results and discuss innovations on the theme of "uniqueness and diversity in a globalised world". ●

Read more: <https://www.e3sensory.eu/>

THEME

SENSORY SCIENCE

Sensory science deals with what we experience through our five senses. In this issue, we take an in-depth look at the subject and interview researchers about how sensory experiences are measured and analysed. ►

Photo Golden Retriever



Conducting a step-by-step sensory analysis, as part of a descriptive test:

1. What does the sample look like?

Is the surface shiny, damp, dry, speckled?

2. What does it smell like?

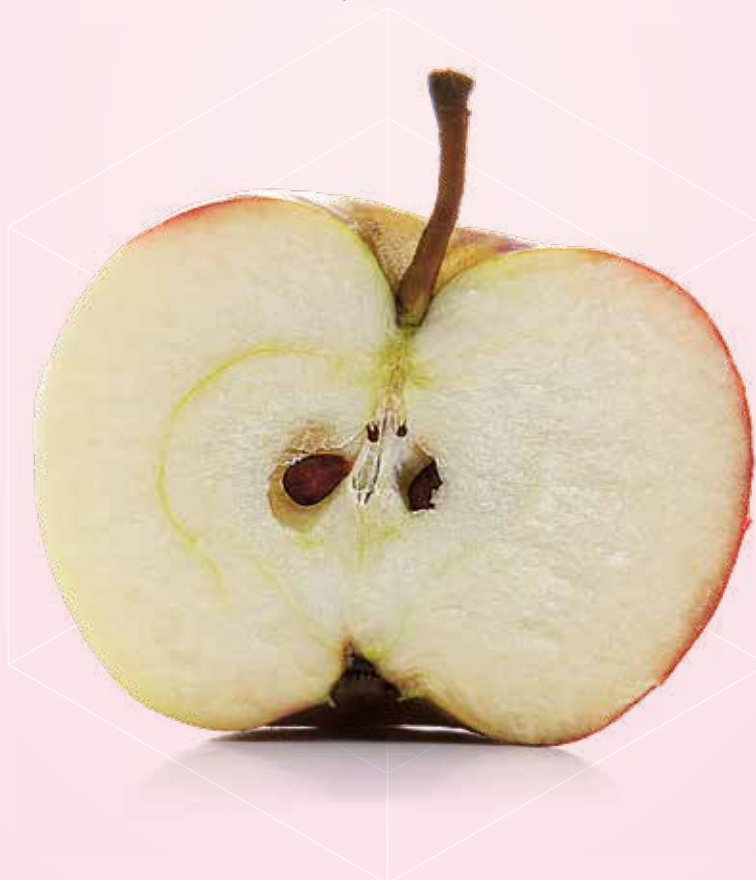
What does the smell remind you of? Is it acrid, sweet, aromatic or something else?

6. What do you think about the sample?

Only consumer panels are asked this question.

3. What is the sample's mouthfeel?

Crispy, light, hard, soft?



5. What does it taste like?

Taste is divided into the basic categories of sweet, salt, sour, bitter, umami.

4. What does the sample sound like?

Does it crunch when you chew, does it sound crisp?

Panels – important tools for sensory analysis

Sensory science is an interdisciplinary field that covers what we can experience using our senses. The area is dynamic and there is now a wealth of methods for measuring and analysing sensory experiences, says Åsa Öström, professor of culinary arts and meal science at the School of Hospitality, Culinary Arts and Meal Science, Örebro University.

Text Karin Janson

In sensory science, experiences are measured via sight, hearing, taste, smell and touch. That a piece of food looks, tastes and smells a particular way may seem obvious, but it also provides an experience of touch and sound.

“By feeling, we mean how the food feels. If you eat it using your hands then the touch is there, otherwise it’s about how it feels in your mouth. Hearing is associated with texture – you expect that crispbread will make a sound when you eat it, and that you will hear a sausage skin pop,” says Öström.

THE RESEARCH FIELD links data from analytical methods with affective data, i.e. what consumers like.

“When we know a product’s chemical composition and how it is perceived sensorially, we can link them together and gain valuable insights. We can understand why flavours are perceived as they are, and then control sensory properties and their approval when developing foods,” says Öström.

Difference tests and descriptive tests

are two methods for sensory analysis. Difference tests use a selected and trained panel; they can be used to ensure that a product’s quality lasts over time, or when a product is changed, so it will not be experienced differently.

DESCRIPTIVE TESTS ARE used to evaluate foodstuffs when developing new products, or perhaps to compare certain products with other ones.

“It used to be strictly the case that tasters were selected and had sensory training. However, consumer panels have become more common, which has led to a quicker method being developed where tasters don’t need training. Product development can be geared towards the relevant target group, such as children or elderly people,” she says.

If a trained panel is used in a descriptive test, around eight to twelve tasters are needed. Training a panel should result in them being able to discern differing flavours even at low concentrations,

identifying aromas and flavours and being able to repeat an evaluation when the same sample appears again.

“Take an apple, where acidity could be a relevant sensory property that needs measuring. We then have to define the property to be able to evaluate the intensity of acidity, from low to high, on an intensity scale.”

A consumer panel has more participants, up to 60 people is common, so responses can be statistically significant. There are many different methods for sensory consumer evaluations, but the order in which the samples are served is always important.

“There is a method called the triangle test. This is a difference test where tasters get three samples, two of which are identical. The aim is to identify which sample is the odd one out. If the taster cannot tell the difference between them, there is a tendency to select the sample in the middle. This means it’s important that the tasters get the samples in different orders, so the results are not wrongly weighted,” says Öström.

THE AVAILABLE TOOLS for the statistical processing and analysis of collected data have almost infinite potential.

“Statistics drives the development of sensory science methodology; evaluations can generate very complex data matrices. Previously, each property was evaluated separately, but the new methods allow us to put together different datatypes and obtain a wealth of information about what different consumer groups like.” ●



PHOTO: JESPER MATTSSON



“We can understand why flavours are perceived as they are, and then control sensory properties and their approval when developing foods.”

Åsa Öström Professor of Culinary Arts and Meal Science, Örebro University

Investigating the flavour of heritage grains

Flavour-wise, heritage wheats are little different to conventional wheat varieties, but there is a greater difference in their baking properties, according to a study in which Karin Wendin, professor of food and meal science at Kristianstad University, led the sensory analysis.

Text Karin Janson

The “Historiska sädeslag i framtidens mat” (historic grains in future foods) research project, led by Karin Gerhardt at the Swedish University of Agricultural Sciences, is investigating older varieties of wheat and rye and their potential in organic production. Heritage grains are varieties that existed prior to modern plant breeding; they have high genetic diversity and often have regional links.

Karin Wendin, Kristianstad University, is responsible for the sensory part of the project, in which heritage grains are compared to modern varieties. First, they surveyed attitudes to heritage grains, with 500 respondents.

“The survey showed that consumers felt very positive towards heritage grains, and they mainly want them in products such as bread and pasta, preferably made from grains grown nearby.”

OTHER TYPES OF WHEAT, such as Ölandsvete, Dala lantvete and spelt were compared to newer varieties such as Skye. The wheat was ground in a hand grain mill, so all the flours had the same particle size. All the flour samples were analysed by a sensory panel, selected and trained in accordance with ISO standards.

“It is important to have a standardised method, so the results are relevant and comparable

with other research projects,” emphasises Wendin.

The newly ground flour was combined with hot water and then underwent sensory analysis. The selected sensory attributes included the basic categories of sweet, salt, sour, bitter and wheat flavour, textural properties such as firmness and granularity, the scent of wheat and bread, and colour.

“The older varieties were somewhat sweeter, otherwise the differences were that they were more brown than beige-coloured, and had a firmer consistency.”

In a trial with different consumer groups, porridge made from crushed heritage grains from Källunda Farm was tested for consumer approval.

“We tested the porridge on two consumer groups, one at an orienteering race and one at a food fair. We found that the foodies felt most positive towards the porridge, both its taste and texture.”

ANOTHER TRIAL COMPARED products like pasta, brioche and biscuits made from various heritage varieties with ones containing modern wheat. The conclusion was that the variety did not matter. Flavour-wise, the differences between the tested heritage and modern wheat varieties were not great. Modern wheat varieties rose better and produced bigger loaves than the heritage varieties.

The project also did baking tests using flour from a heritage rye that was compared to flour from modern ryes. The main difference was their colour, not so much the taste. ●

Reference: Zamaratskaia et al., *Trends in Food Science and Technology*, 2021.



↑ Heritage grain varieties had a slightly sweeter taste.

→ Karin Wendin, Kristianstad University.

“The survey showed that consumers felt very positive towards heritage grains.”

Karin Wendin
Professor
Kristianstad
University.



SENSORY SCIENCE

Sensorics is not just about how individual products taste or smell, but can also involve the entire experience of a meal. At the Flavoria cafeteria in Åbo, Finland, new food can be tested and evaluated in a lunchtime setting. Text Karin Janson



↑ In the Flavoria cafeteria, food is weighed before and after it is served.

PHOTO: HANNA OKSANEN / UNIVERSITY OF TURKU COMMUNICATIONS

A MULTISENSORIAL

Mari Sandell is professor of sensory food science at Helsinki University. She is a member of the scientific board for Flavoria, which is both a cafeteria and a research platform coordinated by Åbo Akademi University. Several Finnish universities cooperate here.

“We are a multidisciplinary group that can use Flavoria from many consumer behaviour perspectives. We also help businesses with consumer tests, but they do not have direct access to the data we collect,” she says.

FLAVORIA IS LIKE an ordinary cafeteria, serving lunches to university staff, students and the public. Lunch guests can choose to log in using an app that stores data on the university server. Among

other things, it measures how much food you put on your plate, how much food is thrown away and the amount of various nutrients found in the food.

“This allows people who have the app to follow their nutritional intake over time and see how much protein or fat they have eaten for lunch that week, for example. This is a nudge towards eating better and reducing food waste,” says Sandell.

INVESTIGATING HOW PEOPLE can change their behaviour and choose plant-based proteins rather than meat is an important element of this research, because 79 per cent of Finnish men eat more than 500 g of red or processed meat every week, which is the maximum recommendation in the Nordic Nutrition Recommendations. The equivalent figure for Finnish women is 26 per cent.

“It is easy to get people to taste a new food. The challenge is to get them to continue consuming it. Aroma is important for the experience, as well as the food’s appearance, whether you eat with your fingers or cutlery, its mouthfeel and the setting we eat in.”

THE CAFETERIA HAS a special multisensory area that can seat 40 people in a modifiable setting.

“We can create a space like a forest or the sea, for example, using sounds and moving images. What we’ve seen is that participants have more appetite if the environment is motivating for them.”

In one study, Mari Sandell and her colleagues investigated whether nudging could make more lunch guests choose the vegetarian option, and thus help more people follow the Nordic



PHOTO: FLAVORIA

↑ The multisensory space called Aistikattila allows studies of how the environment affects appetite.

RESEARCH CAFETERIA

Nutrition Recommendations. The study had 163 participants aged 18 to 65, who chose between a meat dish and an identical vegetarian dish with fava beans. They were then offered different menus, where either the meat or the plant-based protein was presented as the dish of the day. They were also presented in a different order, with either the meat or the plant-based dish first. The study showed no measurable difference in behaviour, whether the plant-based dish was presented as dish of the day or served first.

“This is the first study of its kind in a Finnish lunch setting. Perhaps we need to make more radical changes to the serving sequence to get more people to choose the vegetarian option,” summarises Sandell.

One challenge in getting people to eat

“It is easy to get people to taste a new food. The challenge is to get them to continue consuming it!”

Mari Sandell Professor,
Helsinki University

more plant-based protein is the somewhat bitter taste that occurs naturally in most grains.

“My research team have studied individual differences in sensory experience and found that some people experience bitter flavours more strongly than

others. Like coriander, which some people dislike and others love.”

Various methods can be used to remove the bitterness, such as plant breeding – which has long-term results, or processing and masking through the use of sugar and salt, for example, which has immediate results.

“Often, however, a small amount is left, and then our personal background and how our taste receptors react play a role. This is a challenge for the industry. One solution could be to place higher demands on ingredients and analyse taste profiles before buying them. If an ingredient is more challenging, such as very bitter, processing and masking methods need to be more creative, using other tastes.” ●

Ref: Nykänen et al., *Nutrients*, 2022



➤ The nutritional profile of oats suits older people, according to Cecilia Tullberg.

The senses of taste and smell decline in many older people, which can lead to poorer appetite. A new research project at Lund University, will develop grain-based products that are nutritious, tasty and attractive to this target group. **Text Per Westergård**

Developing grain products for older people

When older people lose their appetites it often leads to a reduced enjoyment of life. What we eat and, not least, how we experience mealtimes, is thus an important health issue.

“We already know that tastebuds, bioavailability and nutritional needs change as we age. So we need more research into the best way to adapt food to deal with these changes,” says Cecilia Tullberg, researcher at the Division of Biotechnology at Lund University. She is responsible for a new research project whose name translates as “More taste, less waste – sustainable production of healthy, nutritious, grain-based food for older people, focusing on their experience of flavour”.

ONE OF THE PROJECT’S aims is to develop products based on cereals, with a balanced protein and fibre content and a nutritional profile adapted to the target group. Another is to try to use the entire kernel by working with wholegrains, avoiding the creation of side streams that are not used in the product.

“As the population grows older, there is an increasing need and demand for sustainable and nutritious products. However, this isn’t enough, they must also be attractive to eat – for all our senses.”

Tullberg says that oats have an interesting nutritional profile, because the kernels have high levels of fat and protein, with an interesting fat profile. Grains’ large fibre content is normally considered an advantage, but it could be a concern for this group as they primarily need food that is nutrient dense.



PHOTO: CHRISTOFFER NILSSON

“...we need more research into the best way to adapt food to deal with these changes”

Cecilia Tullberg
Researcher, Lund University.

MORE ABOUT THE PROJECT

The “More Taste Less Waste” project is conducted in partnership between Lund University, the University of Copenhagen, Lantmännen and ScanOats. The project is funded by Formas.

INITIALLY, RESEARCHERS will develop one or more product prototypes, based on a combination of grains. These will undergo processing to reduce the particle size and achieve a smoother structure, as well as to remove unwanted tastes, for example. The final product must be easy to eat.

“Fibre-rich products can be experienced as astringent and bitter, and not so tasty. We hope to be able to minimise these properties through processing, and then evaluate the results sensorially and physiochemically,” says Tullberg.

The researchers in Lund will be working with a chef to develop a final product with a flavour adapted to the target group of older people. Hopefully, this will supplement the many nutritional drinks and products that are currently available.

THE SENSORY EVALUATION will be performed by researchers at the University of Copenhagen, led by Wender Bredie, professor of sensory science.

“In the development phase we will perform rapid sensory testing to investigate the prototypes’ properties. Later, as we are approaching a finished product, we will conduct sensory testing with a trained panel. And in the final phase, we will have consumer panels in Denmark and Sweden, with participants aged 65 and above,” he says. ●

Benefits of wholegrains confirmed

That wholegrains are good for health is shown by many literature reviews, but it can now be said that the health benefit of eating wholegrains clearly outweighs any potential risk. This is the conclusion of the Swedish Food Agency's recent review – the first of its kind. **Text Linda Swartz**

There are many health benefits to eating wholegrain products. They can reduce the risk of cardiovascular disease, type 2 diabetes and bowel cancer, and make it easier to maintain a healthy weight. The health-promoting components of wholegrains include fibres, B vitamins, minerals and antioxidants. However, grain kernels also contain substances that could be hazardous to health, such as mycotoxins and cadmium, a heavy metal.

To fully explore the benefits versus the risks, the Swedish Food Agency chose to conduct a thorough review of the risks and benefits of consuming wholegrains.

“Our ambition was to look at the overall picture. For cadmium, it is important that the total amount that people are exposed to is not too

high,” says Salomon Sand, who is a toxicologist and evaluates risks and benefits for the Swedish Food Agency.

THE MAIN DATA for the risk-benefit evaluation comprises international studies of the beneficial effect of wholegrains, cadmium's negative health effects – including the EFSA's risk evaluation – and the Food Agency's own studies. Subsequently, the risk-benefit evaluation unit investigated three different scenarios for the consumption of wholegrain products, and how these influence benefit and risk.

In these scenarios, the benefit was defined as a reduced risk of having a first heart attack. The choice of this “benefit” is based on there being a clear effect and data relevant to Swedish conditions. The benefit was compared to the risk of exceeding the EFSA's guidance value for long-term



PHOTO: JEANETTE HÄGGLUND

↑ Salomon Sand, toxicologist and risk-benefit evaluator at the Swedish Food Agency.



PHOTO: ISTOCK

cadmium intake. Cadmium was assessed as being the most relevant risk, according to a prioritisation that included several chemical substances. Excess levels of cadmium increase the risk of kidney damage.

THE THREE SCENARIOS, based on the population's consumption of wholegrains, studied the effect of the proportion of wholegrain products being 50, 75, or 100 percent of total grain consumption. All three scenarios showed that considerably more people could be protected from heart attacks than those whose cadmium intake was too high.

"Quite simply, we wanted to look at what a changed consumption profile could entail for the risks and benefits," says Sand.

Their calculations also showed that the benefit for heart health grew exponentially as wholegrain intake increased. Åsa Brugård Konde,



↑ Åsa Brugård Konde, Nutritionist, Swedish Food Agency.

nutritionist at the Swedish Food Agency, says that the published report reinforces the benefit of dietary wholegrains.

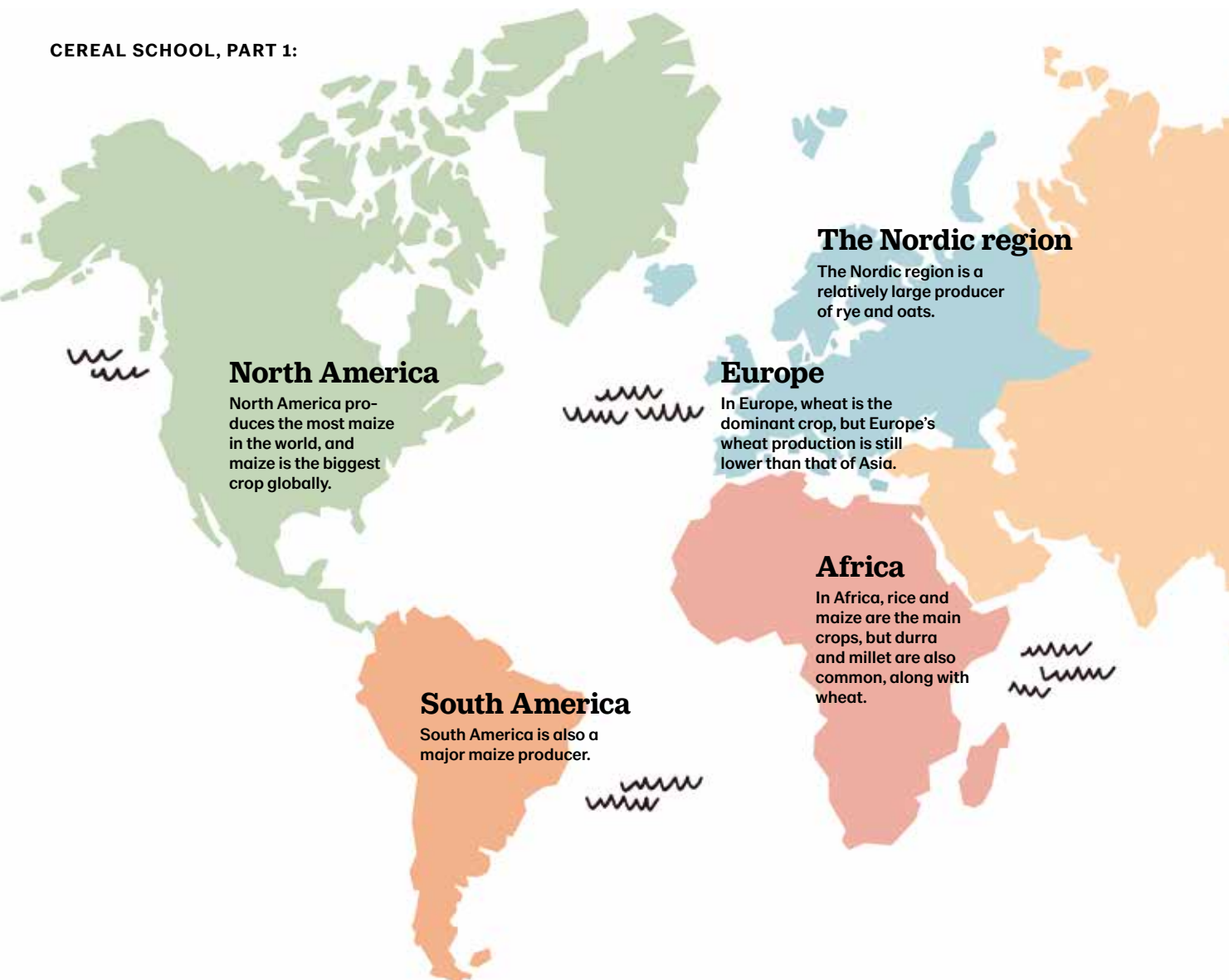
"It further consolidates the Food Agency's advice to make wholegrain products your first choice of grains. We now have an even stronger basis for the great benefits of eating wholegrains."

Work on the sixth edition of the Nordic Nutrition Recommendations, NNR2022, is continuing under Norwegian management. The plan is for the updated recommendations to be published this June.

"Right now, it's difficult to know whether there'll be a need to change anything in Sweden's dietary guidelines after seeing the updated Nordic recommendations," says Brugård Konde. ●

Read more: www.livsmedelsverket.se

CEREAL SCHOOL, PART 1:



North America

North America produces the most maize in the world, and maize is the biggest crop globally.

The Nordic region

The Nordic region is a relatively large producer of rye and oats.

Europe

In Europe, wheat is the dominant crop, but Europe's wheat production is still lower than that of Asia.

Africa

In Africa, rice and maize are the main crops, but durra and millet are also common, along with wheat.

South America

South America is also a major maize producer.

Cereals around the world

People have eaten cereals for thousands of years. Bread, porridge, pasta and rice have long been dietary staples that have filled stomachs and provided nutrients. In our series about cereals, we will describe their unique properties, nutritional content and areas of use as foodstuffs. But first – an overview of the cereals that are grown around the world.

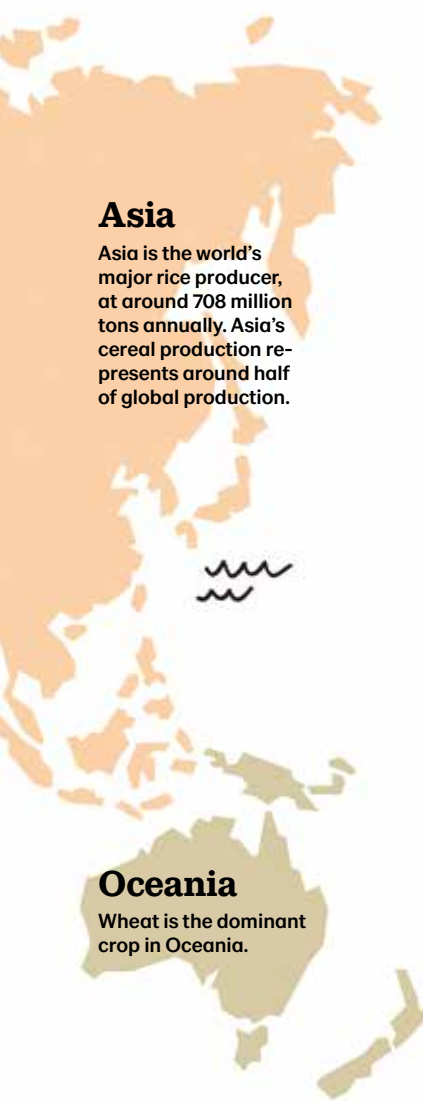
Text Karin Janson
Illustration Lene Due Jensen

In the Nordic countries, we primarily grow wheat, rye, oats and barley. Other cereals are rice, maize, durra (sorghum) and millet. Amaranth, buckwheat and quinoa are like cereals in their use and appearance, but do not belong to the grass family and so are called pseudo-cereals.

Most types of cereal are originally from the Middle East and parts of Asia. Wheat has the largest cultivated surface

area, followed by rice, maize and barley. Oats and rye, of which Sweden grows a relatively large amount, are not among the major global crops.

The types of cereals that are grown differ around the world. Rice dominates in Asia, while maize dominates in America. In Europe, wheat and barley are the most common. Cereals are currently used for food, animal feed and the production of biofuel, materials and green chemicals. ●



Asia

Asia is the world's major rice producer, at around 708 million tons annually. Asia's cereal production represents around half of global production.

Oceania

Wheat is the dominant crop in Oceania.

Wheat



Generally, Sweden grows winter wheat, which is sown one autumn and harvested the next. It tends to have lower protein levels and weaker protein than spring-sown wheat, which is harvested the autumn of the same year.

There are also older wheat varieties, such as spelt. ●

Rye



Rye is sown in the autumn, grows quickly and ripens earlier than wheat. In Sweden, most rye is consumed by humans. In northern and eastern Europe, rye is traditionally used for making bread. ●

Oats



Oats are primarily grown in northern Europe, the US, Canada and Russia. Oats are traditionally used in porridge, gruel, bread and muesli, and now in newer types of products such as milk and meat substitutes. ●

Barley



Barley has long been an important staple in many parts of the world. Europe is now the region that produces the most barley. Barley is used as a raw ingredient for making beer and whiskey, and for crispbread, breakfast cereal, in baby food and as a wholegrain in side dishes. ●

Maize



Maize is primarily grown in Asia, North and South America and Europe. There are different varieties with varying amounts of starch and sugar. Maize has many areas of use, including as a food ingredient and as a flour in bread, or as a breakfast cereal. ●

Rice



Rice is an important staple for much of the global population, and is particularly grown in South and East Asia. Rice can be divided into two main groups: upland rice and deepwater rice. Upland rice can be grown in ordinary fields, while deepwater rice needs submerged fields. ●

Durra



Durra is originally from Africa. It is a tall, maize-like grass that is eaten like rice, as porridge or in bread. Durra is also used as an oil crop. ●

Millet



There are several species of millet, which grow in subtropical areas of South America, India and Russia. Millet can be used as a porridge or ground into flour. ●

Cereal production by region 2021

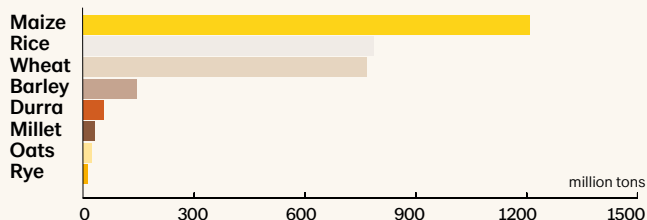
million tons

	Africa	Asia	Europe	North America	Oceania	South America
Barley	7	18	89	10	15	6
Maize	97	379	142	430	0,5	162
Millet	12	17	0,6	0,3	0	0
Oats	0,2	1	14	3	2	2
Rice	37	708	4	12	0,4	26
Rye	0,1	0,8	11	0,7	0	0,2
Durra	26	9	1	11	2	8
Wheat	29	341	269	67	32	29

Cereal production includes use as animal feed, food, biofuel, materials and green chemicals.

REF: FAO STAT

Global cereal production 2021



REF: FAO STAT



PHOTO: NATALIJA PYZHOVA / ISTOCK

↑ The HealthFerm project is examining fermented foods made from grains.

New ecosystem for fermented foods

HealthFerm is a European research project in which researchers from ten countries are studying different aspects of grain-based and fermented foods.

Text Karin Janson

A research team from ten countries, including the Swedish University of Agricultural Sciences (SLU), is participating in the project, an investment worth EUR 13.1 million. HealthFerm's primary aim is to facilitate the transition from traditional to fermented foods using cereals and legumes, and to develop new products.

"Potentially, HealthFerm could increase the number and quality

of the products that may replace traditional meat and dairy products. It is a challenge, because we currently have limited knowledge of fermented food," says Maud Langton, professor at the Department of Molecular Sciences at SLU.

THE CEREALS AND LEGUMES being investigated in the project are peas, fava beans, wheat and oats. In the first stage, various fermentation methods will be evaluated and optimised. Next, the link between the intake of fermented foods and risk factors for disease, as well as the fermented foods' effect on gut flora, will be examined.

The work is being led by Professor Christophe Courtin at KU Leuven, Belgium.

"Risk factors for cardiovascular disease and type 2 diabetes are our primary focus."



Christophe Courtin
Professor, KU Leuven, Belgium

"Risk factors for cardiovascular disease and type 2 diabetes are our primary focus. We will conduct an intervention study to help us understand the health effects of these foods," he says.

FINALLY, CONSUMER ATTITUDES to the fermented foods will be investigated to produce marketing strategies. A research platform will be developed for fermented foods, where the results of the various subprojects will be shared.

"All EU projects are intended to have long-term effects. We hope to lay a foundation for modern research and build an ecosystem that survives long after the end of the project," says Courtin. ●

Read more: www.healthferm.eu

RECIPE

Nettle quiche with a wholegrain crust

Nettles usually start peeping out of the soil by Easter and are the perfect spring greens for this quiche, full of chlorophyll and vitamins. A wonderful spring treat!

Spring nettle quiche

Serves: 1 quiche, serves about 6

Time: 1 hour + 30 min

Crust

100 ml wholegrain flour

200 ml white flour

125 g cold butter

2 tbsp cold water

1 tsp salt

Filling

Approx. 2 litres of fresh nettles

2 garlic cloves

2 scallions or

1 small leek

200 g mature granular cheese

3 eggs

200 ml crème fraîche

100 ml milk

Salt and pepper

Butter for frying

INSTRUCTIONS:

1. Combine the flour and butter to make crumbs, using either your fingertips or a food mixer. Add the water and salt and quickly work into a dough. Press out the dough in a tin with a removable base, about 24 cm in diameter. Prick with a fork and then rest it in the fridge or freezer for 30 minutes.
2. Heat oven to 200°C.
3. Bake the crust in the centre of the oven for about 10 min, or until starting to brown. Reduce the heat to 175°C.
4. Rinse the nettles thoroughly. Boil a saucepan of water and parboil the nettles for a couple of minutes. Leave to drain well and then chop thoroughly.
5. Peel and finely chop the garlic and onion (if using leek, divide it lengthways, rinse carefully and then slice finely). Fry the garlic and onion in butter in a frying pan until soft but not browned. Stir in the nettles and fry until all the moisture has evaporated. Season with salt and pepper.
6. Grate the cheese.
7. Beat together eggs, crème fraîche and milk in a mixing bowl. Stir in the nettles and half the cheese. Place the filling in the crust and sprinkle with the rest of the cheese.
8. Bake the quiche in the middle of the oven for 30–40 minutes, or until the filling has set and has a golden colour. ●

↑ This recipe is from Kungsörnen

FROM MY PERSPECTIVE

Those of us who work with food have an interesting and exciting profession, one that is vitally important. But it can also be frustrating, not least when there is a confusion of different terms, concepts and definitions, each one more unclear than the one before. A current example is “ultra-processed” which now appears in almost every article about food and health, writes Elisabet Rytter, manager for research and nutrition at Livsmedelsföretagen.

The concept of “ultra-processed” has not been adequately processed

What does “processed” mean? A look at European legislation (EC 852/2004) shows us the following: “For the purposes of this Regulation, ‘processing’ means any action that substantially alters the initial product, including heating, smoking, curing, maturing, drying, marinating, extraction, extrusion or a combination of those processes.”

However, this is not the definition used in the NOVA classification, which places food in four groups: 1) Unprocessed and minimally processed foods 2) Processed culinary ingredients 3) Processed foods and 4) Ultra-processed foods. NOVA also includes the choice of ingredients (including additives), place of production, volume produced, whether the food is packaged, etc. I believe that this is a deliberate abuse of the well-defined concept of processed.

I WONDER WHAT the Brazilian researchers who worked on NOVA tried to capture in their classification. They clearly, like many others, work to promote better eating habits, and they want to capture more than “just” food and nutrients. They want to include more factors linked to food production; ones they

believe are associated with the impact on health.

You might think that this is harmless, but adding an undeveloped classification method to research into food’s links to health is problematic. It generates results based on weak methodology. It also creates unnecessary confusion for the consumer and distracts attention from the Swedish Food Agency’s dietary guidelines, which are based on science.

SO – HOW SHOULD WE classify food? The division into healthy/unhealthy food causes problems about which measure to use. It is better to talk about good dietary habits, such as in the Food Agency’s guidelines. If food has to be classified, I like an expression that the Food Agency has now retired: “capacity food”. This is food with a high energy density or a low nutrient density, which we can eat if our “energy allocation” has capacity after it has been filled with enough nutrition. Or, as food researcher Andreas Håkansson calls it, “occasional food”. These two concepts provide information about what this actually is – food that should be eaten in small amounts and not every day.



Elisabet Rytter



PHOTO: ADOBE STOCK

↑ Examples of processed food.



PHOTO: LINDA HARRADINE

Elisabet Rytter
Manager Research and Nutrition,
Livsmedelsföretagen

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



PHOTO: PETER VAHLERSVIK / ISTOCK

↑ For the first time, Lantmännen Research Foundation is funding a project about horse feed.

Research for the future

Tasty pea protein, recyclable plastic from cereals and lower methane emissions from farmland. These are some of the projects that received funding in the autumn call.

Helena Fredriksson Head of Research
Lantmännen Research Foundation

The foundation was looking for knowledge that can contribute to future foods and uses cereals or legumes as a base. Taste is an important factor if green proteins are to succeed in the market. In a new project, researchers at Chalmers University of Technology hope to improve the taste of pea protein.

Over the years, the foundation has funded research on gut health and the link to fibre intake. This year, two researchers from Örebro University received grants in this field: one project will study the effect of cereal fibres locally in the gut, and another focuses on wheat bran and the gut's barrier function.

At the University of Eastern Finland,

the effect of sourdough fermentation and grain sprouts will be studied in a model gut. Researchers at Nofima, Norway, will develop a new method for analysing a potential biomarker for beta-glucan, the cholesterol lowering dietary fibre in oats and barley. A biomarker allows an objective measure of food intake, which is crucial for establishing reliable links between diet and health.

LANTMÄNNEN'S MILLS and biorefineries generate side streams, primarily from wheat and oats, some of which have the potential for developing fossil-free materials. Three new projects at KTH Royal Institute of Technology received funding in this area: one aims to further develop starch-based glue for industrial use; another uses starch as an ingredient in the production of recyclable plastic; the

third aims to develop new materials using plant-based proteins and fibres with functional properties, such as moisture absorption in packaging.

REDUCING METHANE emissions is a decisive issue for future agriculture. A new project at the Swedish University of Agricultural Sciences will produce data on how methane emissions from cropland are affected by fertilising strategies, measures that could reduce the climate impact of farming. On the feed side, the foundation has awarded funding to a horse project for the first time, in which Norwegian and Swedish researchers will study how the feed state can be adapted to more local and sustainable ingredients. Another interesting project will investigate the potential of using recycled ash phosphorus in animal feed, including a risk evaluation of whether the phosphorus is safe to use.

We are eagerly anticipating the results, and look forward to new knowledge that contributes to the development of future foods, materials and agriculture. ●

INVESTING FOR THE FUTURE

In total, the Lantmännen Research Foundation invested SEK 25 million in research in 2022, funding that was then more than doubled with the help of other financiers.

NEWS FROM LANTMÄNNEN RESEARCH FOUNDATION

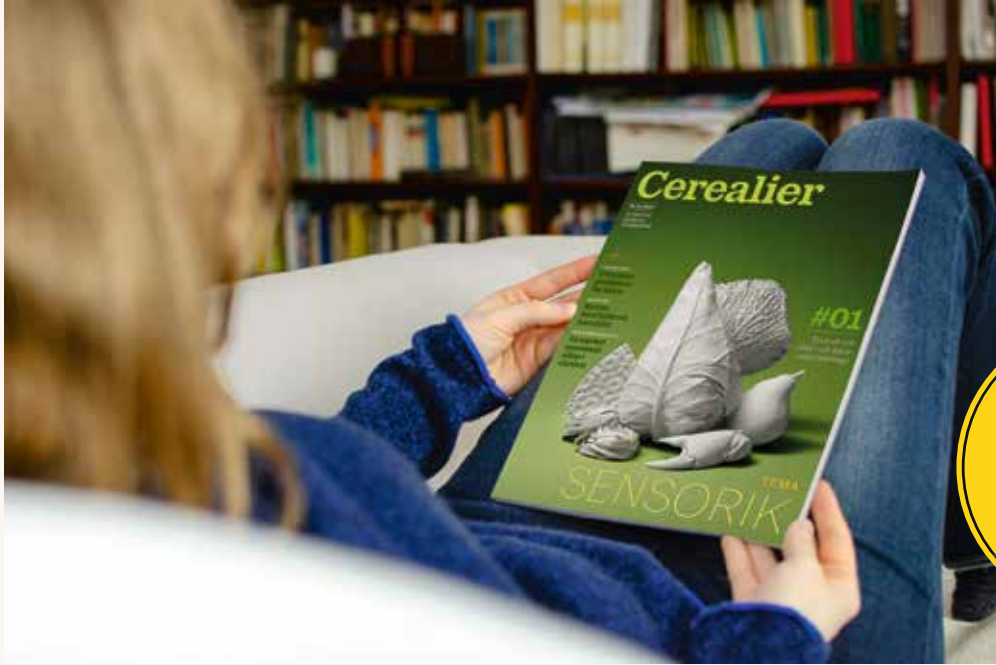


PHOTO: GOLIBO / ISTOCK

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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 holds an open call every autumn, starting in September. See:

www.lantmannen.com/researchfoundation

Applications are assessed on

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

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