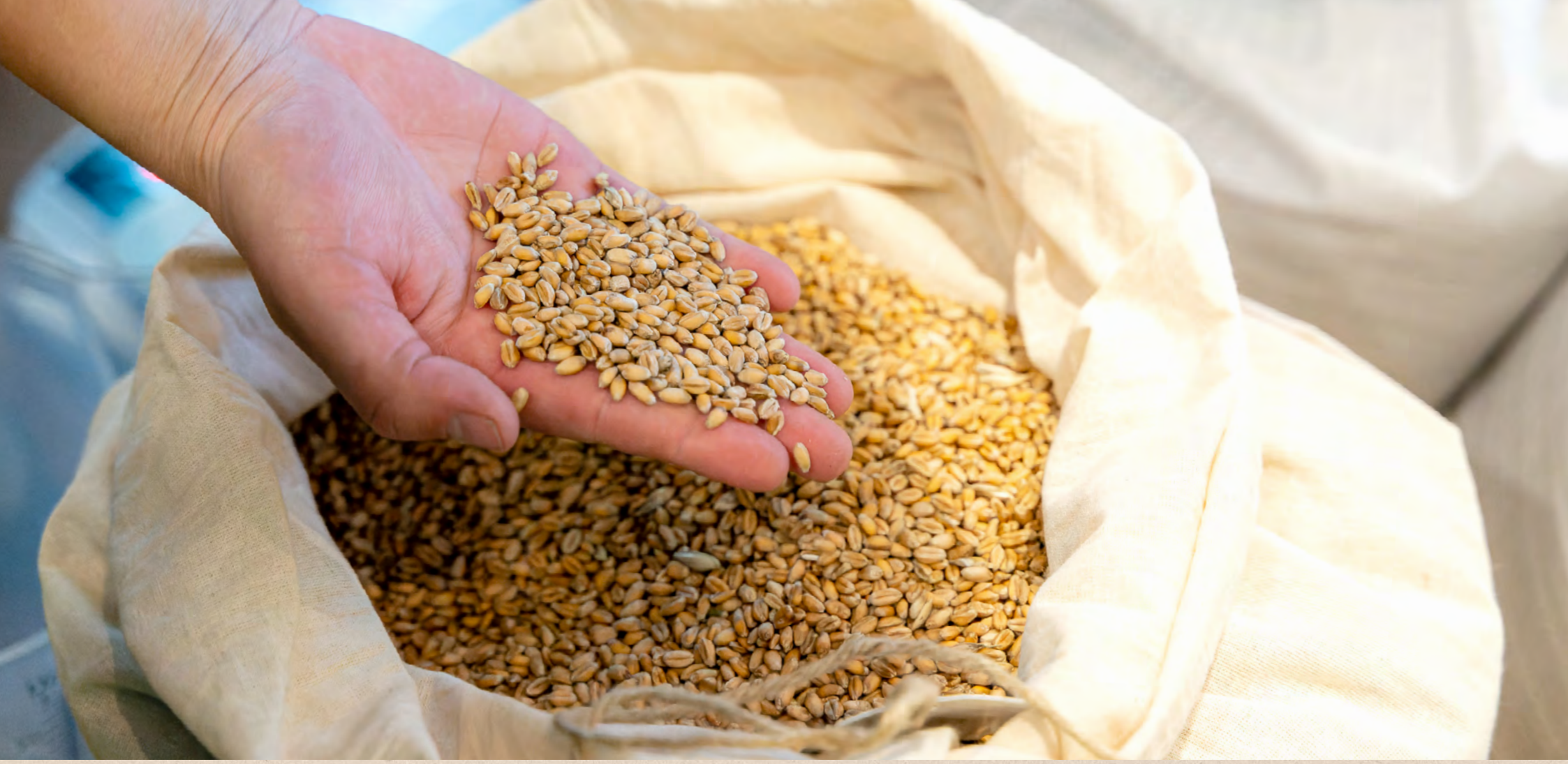


LAB

Low Food Lab:

grains 2.0

In 2020, Low Food conducted an initial study on grains with the support of Flevo Campus, focusing on exploring various culinary applications for ancient grain varieties. This lab, Grains 2.0, is a follow-up to that. This time, instead of forgotten grain varieties, we're focusing on grain varieties that aren't normally eaten by humans. We have set ourselves the challenge of exploring ways of using wheat that would normally be used for animal feed.

About Low Food

Low Food aims to change Dutch gastronomy. Low Food was founded in 2018 by a group of chefs, political scientists and producers. Since then, the movement has grown and so have its ambitions of changing Dutch gastronomy, putting Dutch food culture firmly in first place in the fields of sustainability, inclusion, et cetera. In a world where food security, food sustainability and sustainable agricultural practices are three of the biggest issues, we believe that our food movement can have a major impact on food patterns. Accordingly, Low Food's purpose is to serve as a networking agent and platform where new ideas are created and implemented.

The Low Food Lab brings culinary knowledge, agricultural knowledge and product development together. The Labs are the places where chefs develop new products, preparation methods and techniques that contribute to a fairer, more diverse, healthier and/or more sustainable eating habits. In the Labs, we thus work on food issues for which a culinary solution must be found. Such as smarter ways to valorize residual streams or the development of applications that make certain ingredients accessible to a wider audience.

See www.lowfood.nl for more information.

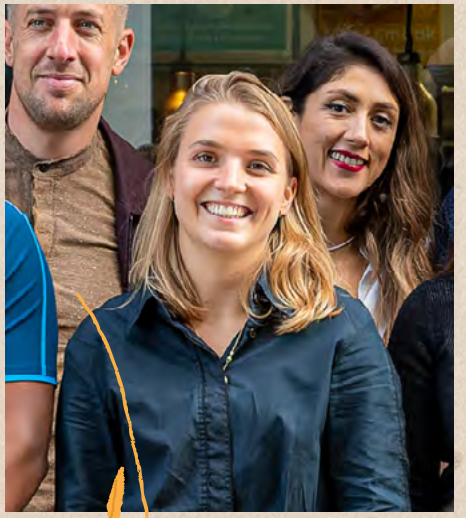
About Flevo Campus

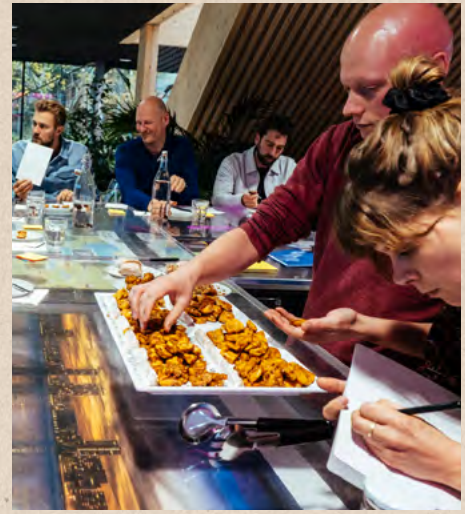
Flevo Campus Knowledge Institute is a joint initiative between the town of Almere, the Province of Flevoland, Wageningen University & Research and Aeres University of Applied Sciences. Guus Nelissen, project manager at Flevo Campus: 'At Flevo Campus, we address a variety of food chain issues through research, innovation and experimentation. We take an interdisciplinary approach, which means that we link up with various parties to come up with new, creative solutions. We don't just leave the research to the scientist; we also bring in food entrepreneurs or professional chefs. Flevo Campus sees a lot of potential in Low Food Lab's experimental research, which investigates food issues from a gastronomic perspective. So, what tastes good, and what works and what doesn't? Historically, these questions have been the source of most of today's culinary knowledge and food innovations – all driven by the ambition and willingness of chefs and small food entrepreneurs to look at food in a different way.

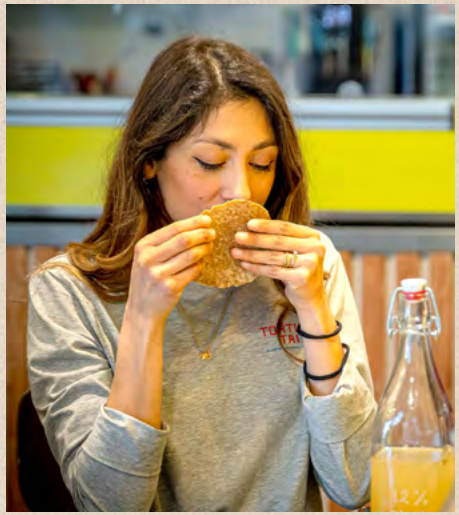
The alliance with the province of Flevoland is also key; Flevoland is one of the main food-producing provinces in the Netherlands. Food security and improving the sustainability of the food and agricultural system are hot topics at the moment. This region in particular is facing a number of challenges in these areas, for which Low Food Labs could provide a solution.'

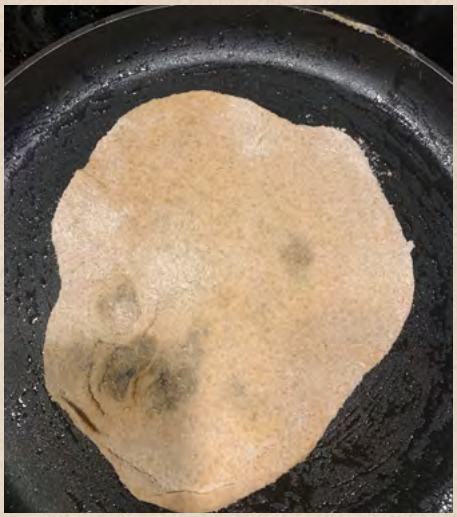
See www.flevocampus.nl for more information.

Index

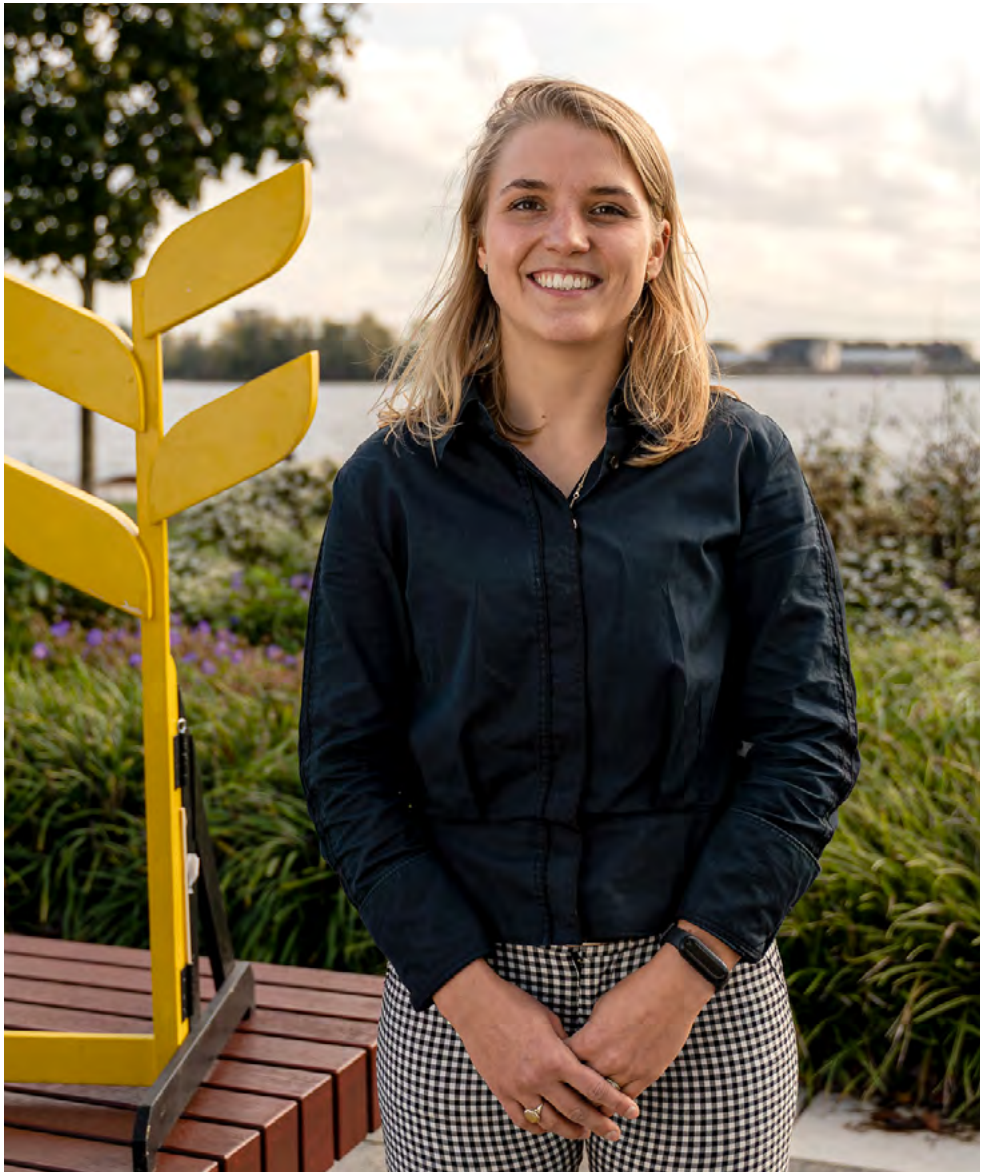








Elzelinde on the Low Food Lab



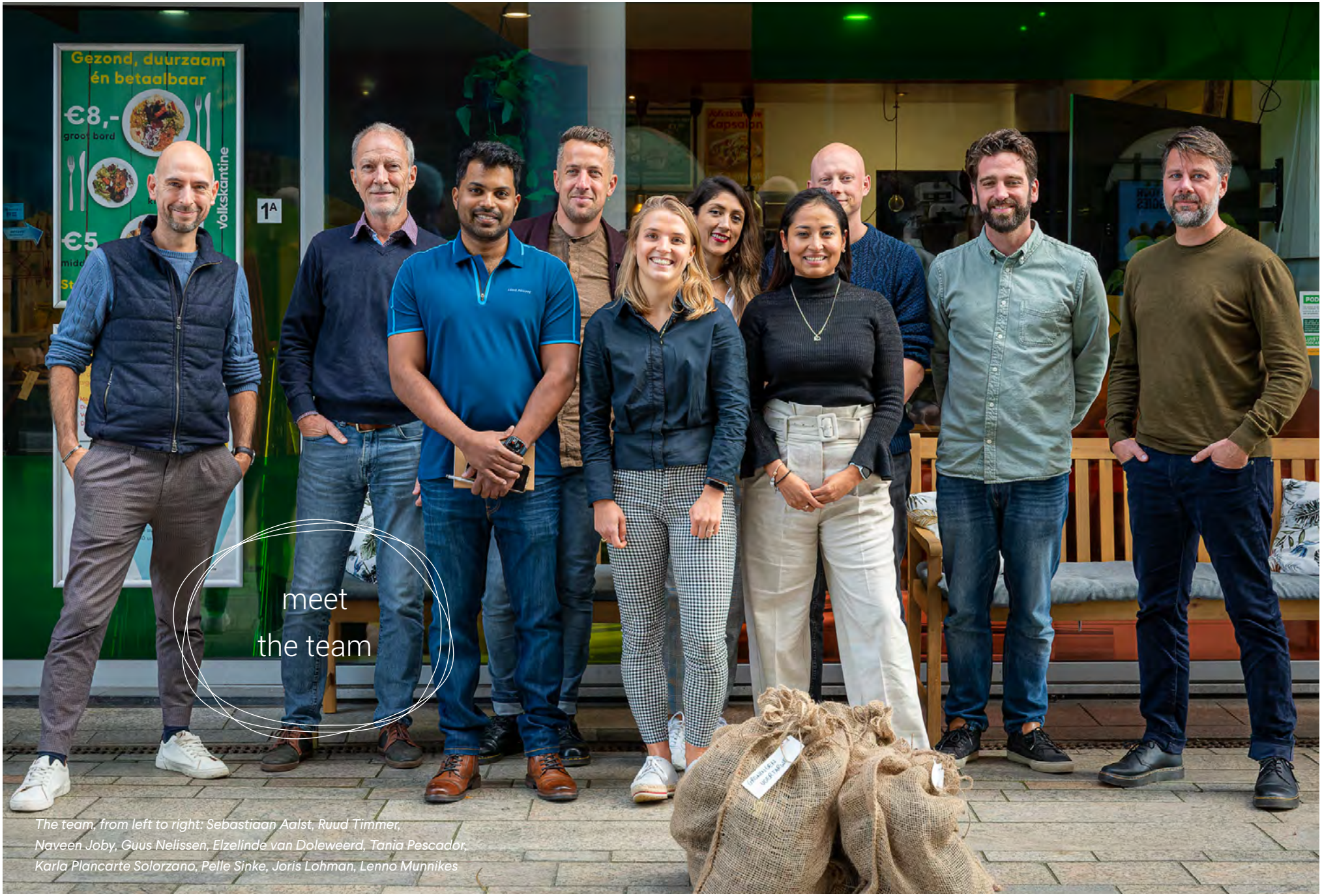
In this lab, we're studying wheat, a cereal that we eat every day in bread. The Netherlands is a real 'bread country', which is why the wheat we grow is selected based on properties for making bread: Dutch bread, as high and airy as possible. For this, we need wheat with a high protein content and high-quality protein. But why do we select it based solely on its properties for baking airy bread? Why is the rest of the wheat – the majority of wheat grown in the Netherlands – all destined for livestock? Why can a cow, chicken or pig eat this wheat and we humans can't?

In this lab, I, together with three producers, took on the challenge of investigating whether this wheat is suitable for us to consume in applications other than bread. **In particular, we're looking at its use in Indian dough products, Mexican tortillas and local tempeh**. The latter might even be a viable alternative to meat products, thereby shortening the food cycle. Who knows, perhaps bitterballen will soon be making way for umami-rich cattle feed tempeh when we go out for drinks?

I hope that with this lab we will be able to inspire Dutch producers to think about how they use wheat. Perhaps there's a cheaper, more local, more sustainable and tastier option out there!

About Elzelinde

Elzelinde van Doleweerd is a researcher in the hospitality sector, focusing in particular on research with a sustainable character. She draws on her background in industrial design and food technology to combine creative, technical methods with chemical processes. In addition to the Low Food Lab's research into cereals, she also leads research activities at the restaurant De Nieuwe Winkel** in Nijmegen. She has also conducted research at the Alchemist restaurant in Copenhagen and participated in the Low Food Lab Broth.



meet the team

The team, from left to right: Sebastiaan Aalst, Ruud Timmer, Naveen Joby, Guus Nelissen, Elzelinde van Doleweerd, Tania Pescador, Karla Plancarte Solorzano, Pelle Sinke, Joris Lohman, Lenno Munnikes

About Grains 2.0: The Research

BACKGROUND & RELEVANCE

Wheat is currently the most widely grown cereal in the Netherlands: we grow around 100,000 to 120,000 hectares of wheat a year. It is also widely used by farmers as a catch crop, as it contributes to soil health and fertility. Of all cereals, wheat – especially winter wheat – is the most profitable for farmers. Winter wheat has a higher yield per hectare, making it a more attractive option for farmers than spring wheat. When it comes to wheat production, a distinction is then made between wheat with baking properties, bread wheat, and wheat for animal feed, feed wheat. There are varieties of both winter and spring wheat that can be used as wheat for baking bread; the rest is feed wheat. This lab is investigating whether this feed wheat can also be used for gastronomic applications.

Protein as a key factor

Even before sowing, the farmer decides which variety of wheat to grow. During harvesting, the trader or co-operative makes a selection and carries out various tests – mainly focusing on protein content – to determine whether the wheat will be used for making bread or for using as feed. Feed wheat has a low protein content (between 9% and 11%) compared to wheat for breadmaking, which has a protein content of at least 11%, preferably 12%. Protein is a key selection criterion because it determines the ability to form gluten; if the wheat is then used to make bread, for example, it will rise well. Due to the primary focus on variety and protein content when classifying wheat, rather than on other quality factors, a substantial amount of wheat often ends up as feed, overlooking its potential for other applications. This then makes it difficult to establish a profitable and distinctive feed wheat stream.

A short, sustainable chain

Growing bread wheat is not a particularly viable option for Dutch farmers. They need to use additional fertilizers to produce wheat of baking quality, which costs more money than the added value of the wheat per tonne. That's why we

currently import a lot of wheat from countries such as France and Germany – despite the fact that Dutch feed wheat may also be suitable for human consumption. Developing more uses for wheat grown in the Netherlands will ensure a shorter chain and a better profit model for farmers. Getting the most out of wheat is all the more important in the current climate, given the volatility of grain prices. This lab focused on this specific issue and sought out a potential application that would enable Dutch farmers to make better use of their wheat, thereby reducing the amount of wheat ending up as feed wheat.

METHODOLOGY

Lead researcher Elzelinde van Doleweerd collaborated with three producers:

- ***Tortillería Taiyari***
- ***Mothers Kitchen Almere***
- ***Boonzaak***

One thing that all these producers have in common is that they all use traditional ingredients from world cuisine in an innovative way. They were given three different types of wheat and asked to see if they could use them in their products. It goes without saying that all the wheat was cleaned before use to ensure that it was safe for human consumption. This involved a simple sieving process to remove small and cracked grains, weed seeds and other minor contaminants. This process is taken a step further in a mill, where pebbles, iron particles and other contaminants that could potentially pose a health risk are also removed.

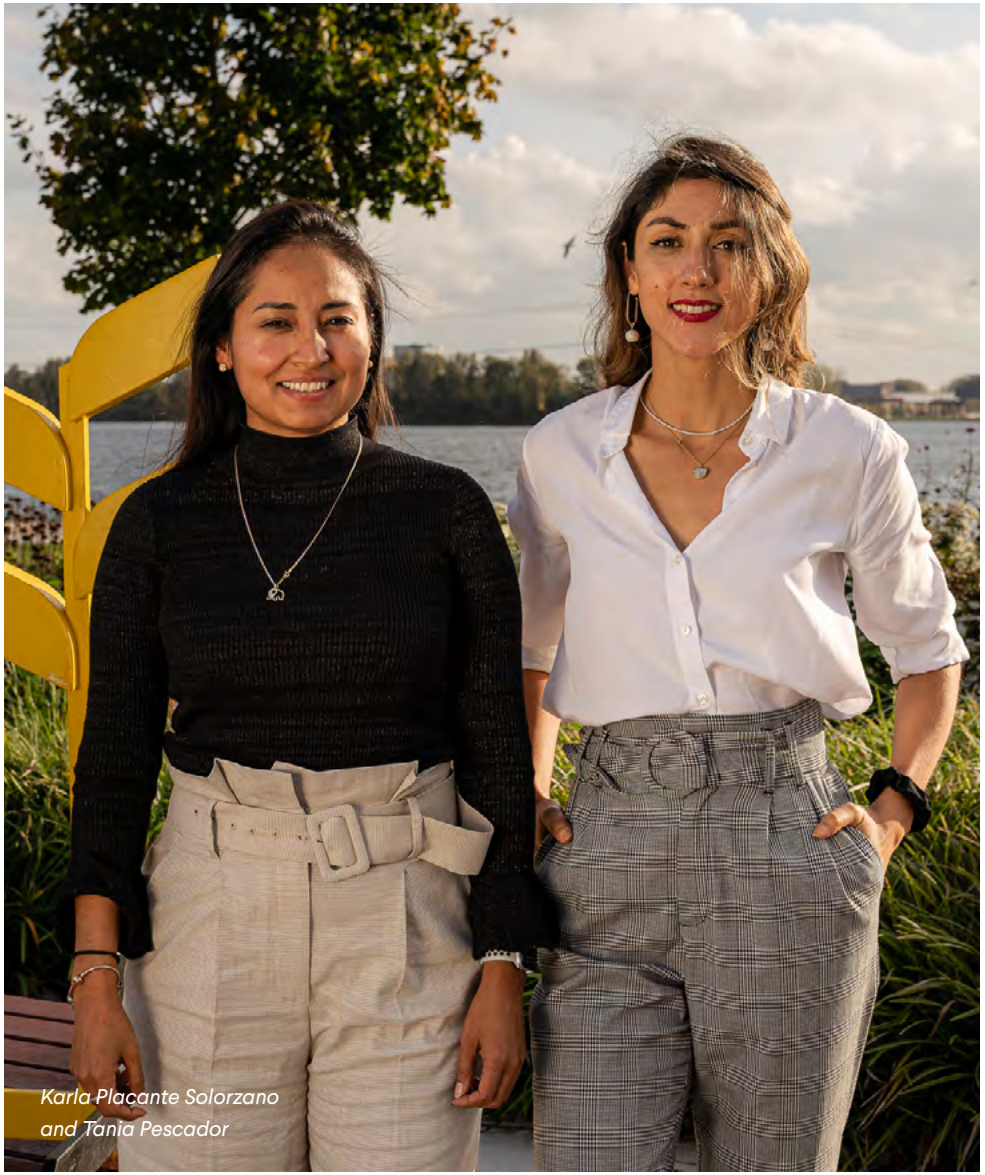
The aim of all the experiments was to come up with a scalable recipe or product that could potentially be sold in local shops and/or supermarkets. The research was carried out over three months, with participants meeting once a month in an open-lab session to share their findings. Producers took to the kitchens, armed with both baking and feed wheat, to run all kinds of experiments. How would the different types of wheat affect their specialities? To find out, the producers did a comparison:

- **BATCH 1:** A mix of different feed wheat varieties from Groningen with a low protein content (10%) and therefore higher starch content.
- **BATCH 2:** A conventional mix of different feed wheat varieties from Flevoland with a high protein content (11%) and therefore lower starch content.
- **BATCH 3:** A bread wheat variety from Flevoland with a high protein content (12%). For this, we collaborated with the Farm of the Future. They cultivated a variety called KWS Extase, which is easy to grow and suitable for human consumption because of its protein content. The harvest of this variety was used for the experiments.

All three participants came to the same conclusion: feed wheat can certainly be used for all kinds of culinary applications. In fact, in many cases, feed wheat even produced better results than bread wheat! In the next chapter, we dive into the experiments and results in more detail.

Tasting session at Food Forum in Almere

Tortillería Taiyari

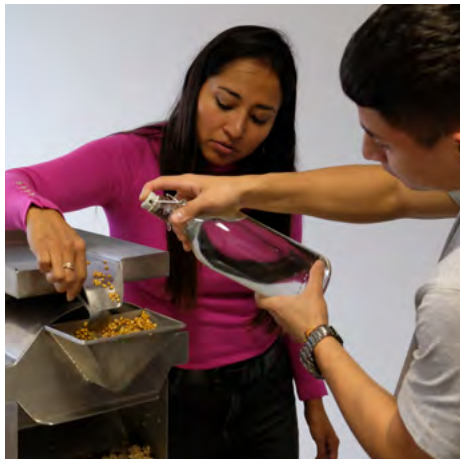


Karla Placante Solorzano and Tania Pescador

Tortillería Taiyari is the Netherlands' first authentic Mexican tortilla producer. Founder Karla Plancarte Solorzano grew up in Mexico and moved to the Netherlands nine years ago. Together with Tania Pescador, she is on a mission to introduce the Dutch to the authentic Mexican tortilla. Tortillería Taiyari specializes in corn tortillas, which are traditionally eaten in central and southern Mexico. However, in the north, towards the US border, people also make their tortillas from flour. Karla and Tania set out to discover how to make the best flour tortilla using Dutch wheat.

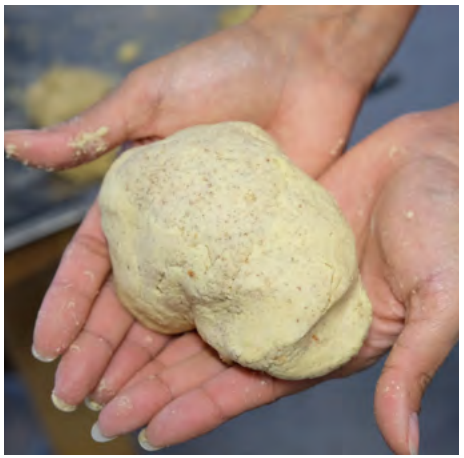
The research

Karla and Tania make their corn tortillas using nixtamalization – a process for preparing corn (or grain) by cooking it and then soaking it in calcium hydroxide. It is left to soak overnight and then rinsed. The chemical reaction separates the hull from the kernels, allowing them to absorb more water. This not only changes the structure, but also the flavour and nutritional value; the process

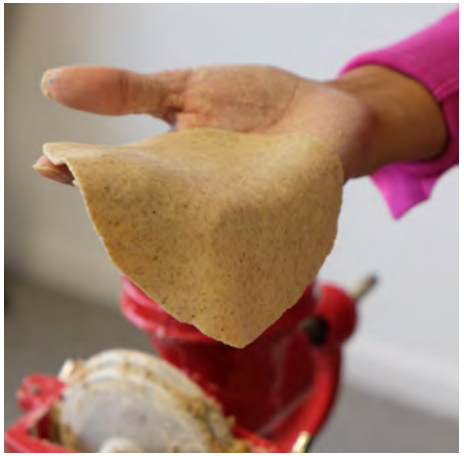


increases the bioavailability of vitamin B3, for example. They grind the result into a fresh dough to make it soft and smooth, which they then put in the tortilla oven. No flour is usually added in this process; the dough is already moist.

Karla and Tania looked at a number of different ways of making wheat tortillas. The first step was to see if the nixtamalization process would also work with wheat (whole wheat grains), which she did simply by replacing the corn with wheat. This didn't work; for all types of wheat tested, the



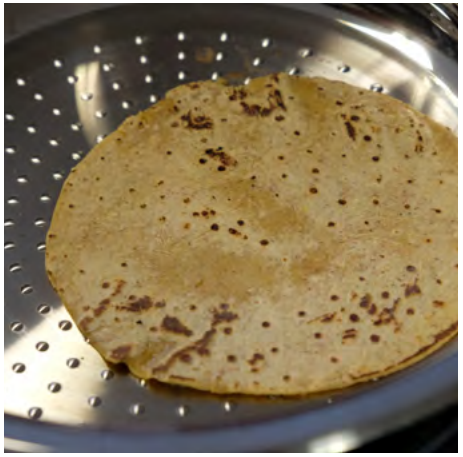
resulting product was slimy and mushy, sticking to the volcanic stones of the machine used to grind the product. They experimented with a variation using a mix of dry milled wheat (flour) and wet corn dough (from the nixtamalization process). This worked well, with a ratio of 70% corn dough and 30% wheat. They also made a variation using only dry milled wheat (flour), which also worked well.



The three different types of wheat produced clear results, with feed wheat (10%) being the absolute favourite. The flavour and aroma were no different from the 11% feed wheat, but the texture was better: more hydrated and smoother. The bread wheat with 12% protein, however, didn't taste good – and it dried out very quickly.

What's next?

Karla and Tania are very pleased with the results, but the recipe still needs some tweaking. For example, the flour could be made even finer and fat could be added. When you make a dough from corn, it is dry and grainy, but when you add wheat, it quickly becomes very elastic. They see many opportunities for the combination tortilla, for example in restaurants, because it dries out less easily than the traditional corn tortilla and is therefore easier to use.



Feed Wheat Tortillas

RECIPE BY TORTILLERÍA TAIYARI

INGREDIENTS

- 100 grams wheat
- 20 ml oil or butter
- 50 ml water

EQUIPMENT

- Grain mill
- Tortilla press
- Frying pan

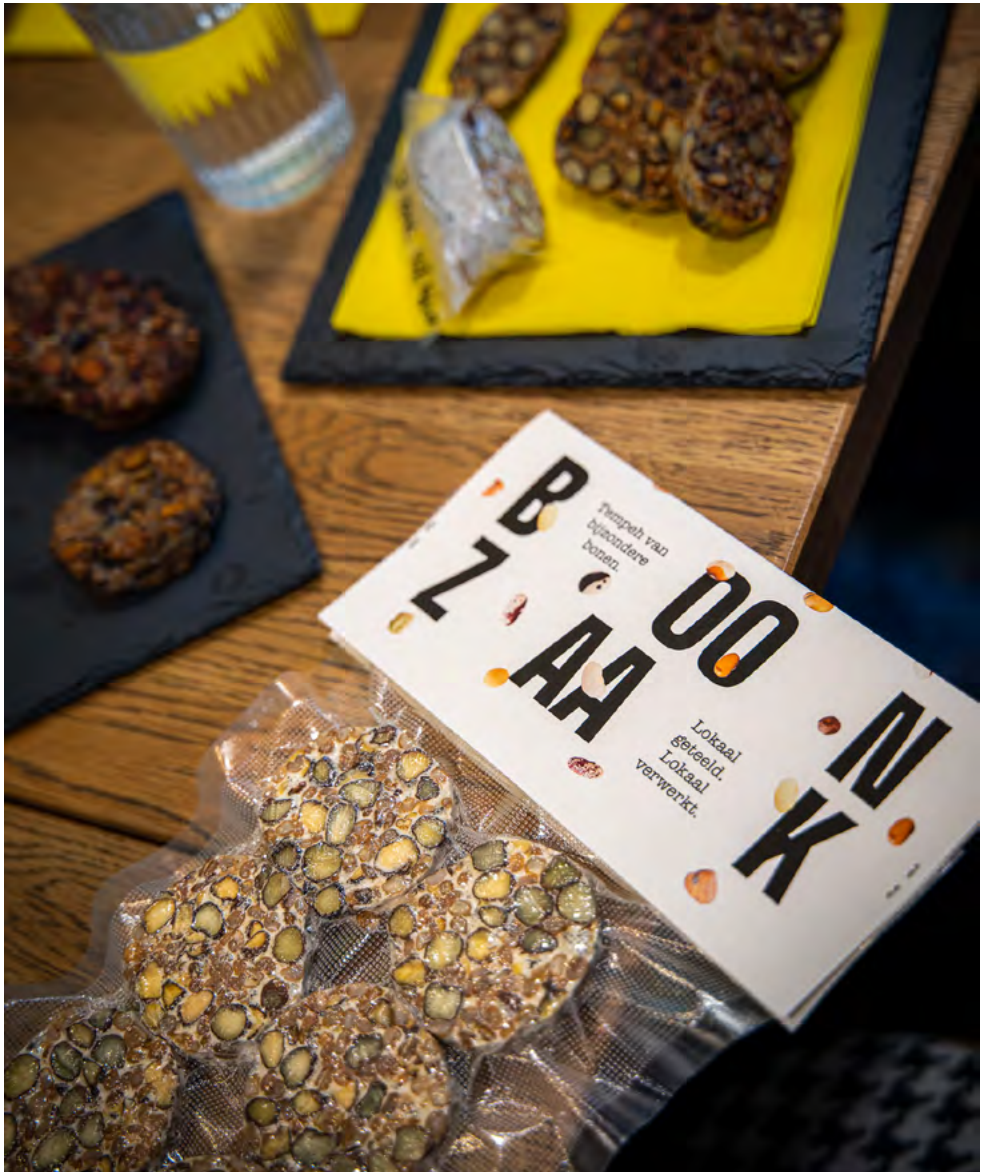
METHOD

Grind the wheat finely without adding moisture, then add the oil or butter. Add water to get the right consistency for the dough, so that you can make small 30 grams balls. Prepare the tortilla press with plastic foil on both sides. One by one, press the dough balls flat, until you have the thickness and size needed (14 cm). Heat them in a dry, non-stick pan on a medium for one minute on each side, because the wheat in the tortilla needs to cook. When the tortillas are ready you can top them with your favorite condiments.

SUGGESTIONS

- Spread the tortillas with guacamole, fried veggies, pickled onion, fresh coriander, black beans, fish, then roll them up to eat.
- Make quesadillas with fresh salsa (pico de gallo), tomato, red onion, fresh coriander, lime.

Boonzaak



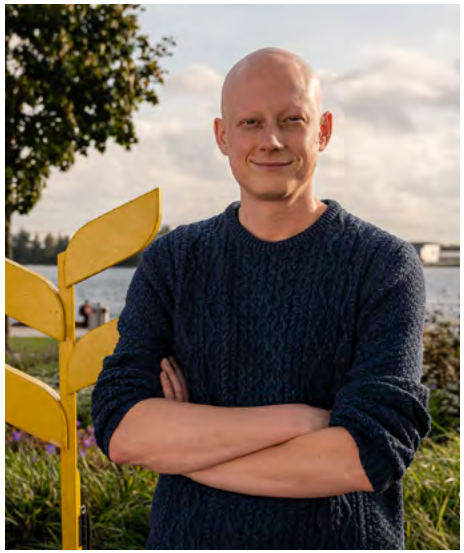
Many beans are no longer eaten or grown, yet they offer a rich spectrum of flavours, colours and gastronomic experiences.

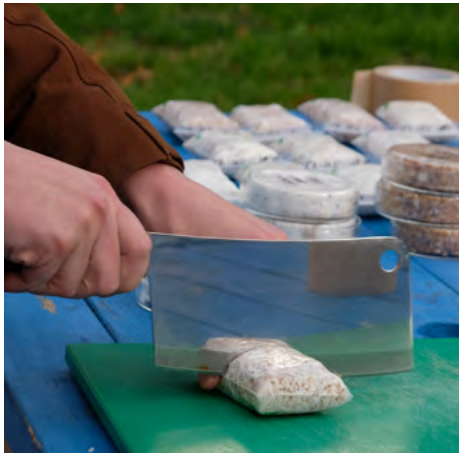
Through their start-up Boonzaak, Pelle Sinke and Loïs Overbosch hope to put beans back on the menu in restaurants up and down the country. Many beans are no longer eaten or grown, yet they offer a rich spectrum of flavours, colours and gastronomic experiences. They use these forgotten beans to make the most delicious tempeh.

'Tempeh' is the term used to describe a cooking technique that originated in Indonesia. The product is traditionally made from beans but can also be made from grains and leftovers. The ingredients are fermented into a compact cake, with a little help from specific fungal cultures. The most popular version today is made from soya beans, but it can also be made using a variety of flavours and ingredients. In this lab, Pelle and Loïs investigated the possibility of using feed wheat in this process.

The research

Pelle and Loïs had never made tempeh from wheat, but they had made it from other grains. So the first question was: does wheat ferment well? To make tempeh, you start by cooking the ingredients, then drying them and letting them cool to room temperature. Then you add a fungal culture (two strains of Rhizopus: Oligosporus and Oryzae) and ferment everything together for about 40 hours at 30°C.



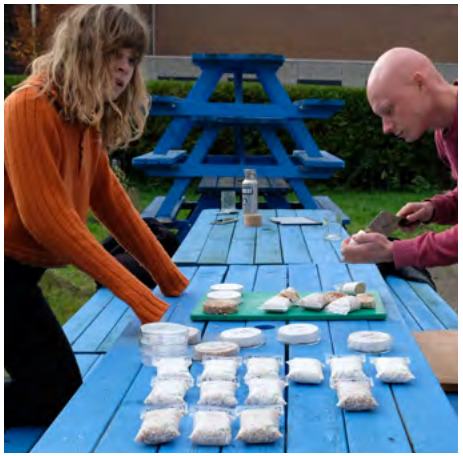


Types of wheat, ratios and pulses

The first round of experiments focused on comparing the types of wheat, the ratios of wheat to pulses and the type of pulses. For this, the teams used both whole and cracked wheat grains (coarsely ground in a malt mill), which they then mixed with pulses in various ratios (white beans and grey peas). They quickly realized that tempeh made from wheat alone wouldn't work, and that pulses had to be added; the best mixture was 40% wheat and 60% peas. They also found that the mould didn't grow well on the whole grains because of the bran that surrounds the grain, which provides a layer of natural protection against mould. During the production process, there was little to separate the three types of wheat; they fermented equally well or poorly. Any differences arose from the pre-processing of the grains.

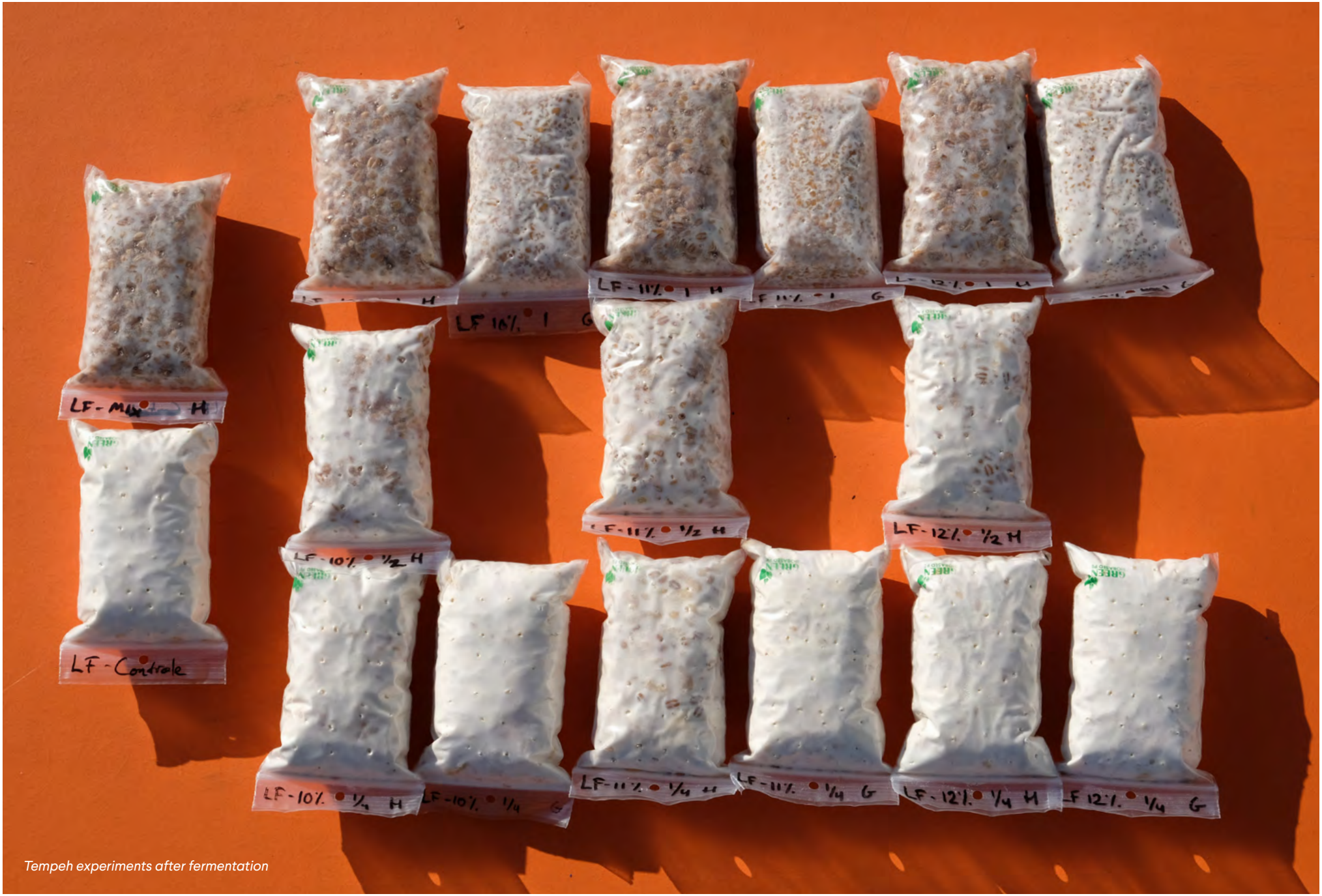
The taste test

Following a taste test, Pelle and Lois decided to experiment further with wheat and grey peas. The wheat gave a savoury, bread-like flavour, and the tasting panel liked the whole wheat grains, which gave the tempeh a bite. These chewy grains work well with the soft and sweet peas. Surprisingly, the feed wheat version with 10% protein came out on top; it produces a more savoury and fuller flavour. Joris Bijdendijk on the taste: 'It strikes the best balance between acidity and sweetness.' The bread wheat gave a sourer taste.



Pre-processing feed wheat

In the second round of experiments, Pelle en Loïs looked at the different ways of pre-processing the feed wheat, as the mould didn't grow very well on whole grains – which gave the best bite. The pre-processing methods they tried were 1) crushing 2) cooking and cooling in the refrigerator and slightly crushing them in the blender and 3) using nixtamalization, inspired by Tortillería Tayari's technique (see page 9). The third option worked best: the mould interacted well with the wheat, allowing the use of whole grains and retaining the bite preferred by the tasting panel.



Tempeh experiments after fermentation

Feed Wheat Tempeh

RECIPE BY BOONZAAK

INGREDIENTS

- 600 grams of feed wheat (10% protein)
- 9 grams of calcium hydroxide (0.5% of total weight of wheat and water)
- 100 ml of vinegar (or lactic acid; for lactic acid use 18 grams per 4 litres)
- 900 grams of grey peas
- Salt
- Tempeh starter
- Field bean flour

EQUIPMENT

- Plastic zip-lock bags
- Drawing pin or metal skewer
- Blender with pulsing function
- Cooking pan
- Fermentation chamber/place with a constant temperature of 30°C.

STEPS

Wheat

Heat 1,200 grams of water to 80°C, add the calcium hydroxide. Pour this over the wheat. Let the wheat with calcium hydroxide stand for one night (about 12 hours). Rinse well. Boil the wheat for 5 minutes in 1.5 litres of water with 100 ml of vinegar (or less lactic acid). This lowers the pH, which is necessary for good fermentation. Drain the wheat and spread it out on tea towels to dry.

Grey pea

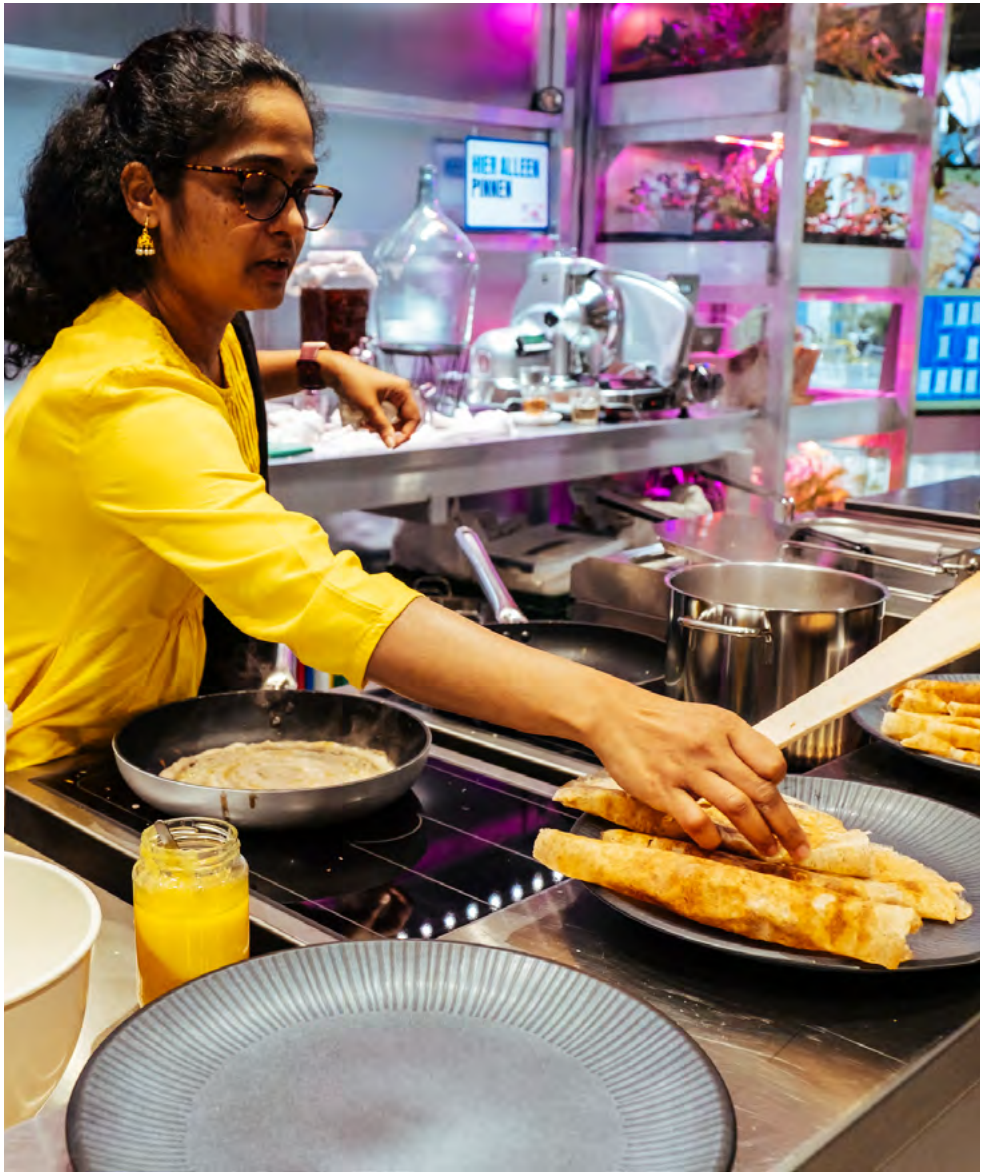
Soak the grey pea in plenty of water with 2% salt solution. Leave this overnight and then drain. Then boil the peas in 1.5 litres of water with 100 ml of vinegar. Drain the peas and spread them out on tea towels to dry. Blend one third of the total pea mixture (coarse mixture; it is important that some of the beans crack here to allow the mould to grow better). Mix this with the rest of the peas.

Mix the bean mixture with the wheat (ratio: 40% wheat, 60% bean mixture. After cooking, this ratio will be slightly different than before cooking). You can use the rest of the beans in a salad, for example. Mix the tempeh starter with field bean flour, ratio 1 (starter): 4 (field bean flour). Mix the starter mixture into the wheat-bean mix (ratio: 35 grams per kilo). Fill the plastic zip-lock bags with this mixture and make sure it is compact. Prick holes with a drawing pin or metal skewer (thumb distance between the holes). Put in the fermentation cabinet at 30°C for 30-40 hours until you see nice mycelium growth. Cut into 1 to 1.5 cm slices and fry in oil.

SERVING SUGGESTIONS

- (Freshly made) sambal
- Sea salt
- Kecap Manis, lime juice, raw shallot and rawit pepper
- Or try the chutney

Mothers Kitchen Almere

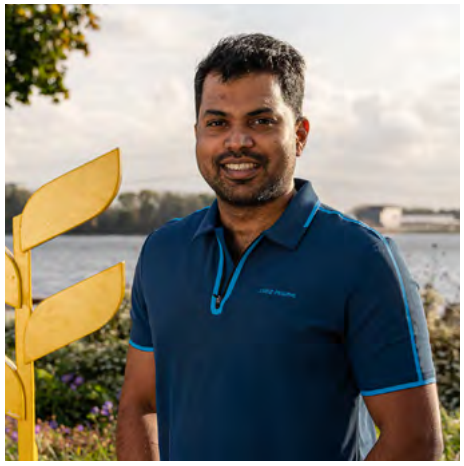


The third participant in the lab was Naveen Joby of Mothers Kitchen Almere, which specializes in Indian batters. Naveen founded his business during the COVID-19 pandemic to provide jobs for Indian mothers who were stuck at home.

Indian cuisine has many different types of pancakes. For the lab, Naveen started with idli dosa – a pancake typically eaten for breakfast. Idli dosas are usually made from a mixture of lentils and rice, which are soaked and then ground using heavy rotating grinding stones. Naveen was curious to see whether he could use feed wheat to make idli dosa batter using the same production method. Dosa is known for being a low-fibre and relatively unhealthy dish. By working with wheat, it might be possible to make a wholemeal – and therefore healthier – version. Naveen also experimented with chapati (also known as roti), a thin flatbread.

The research

Naveen started by making idli dosas with the three varieties of wheat using the same process he normally uses. He mixed wheat, rice and lentils (ratio 2:1:1) and soaked the mixture for four hours. After those four hours, he processed the mixture in his grinder to make a batter, which was then left to ferment for 8 to 12 hours. This



fermentation process worked quite well with the mix, though the batter and water separated faster than normal. Remarkably, all three types of wheat were well suited for making dosas. During the taste test, the members of the panel from India hardly noticed any difference between the different types of wheat. The Dutch panel members, however, did; the feed wheat was slightly sourer.

Following the success of the initial experiments, Naveen set to work on making wheat chapatis. Again, he used the same procedure he would normally, but with the three types of wheat. He ground the flour into fine powder using a mill, and added salt and oil to the mix to make a thick dough. He rolled this dough into small balls, and then rolled out those balls into a round uncooked version of the chapatis. He put these in a pan and fried them until brown on both sides. These flatbreads also worked well with the three types of wheat. The version with bread wheat was a bit softer than the one with the two types of feed wheat, though the difference was minimal. The important thing was to use plenty of oil, otherwise it stuck to the pan. The dough also absorbed more water with wheat, resulting in softer chapatis.

Feed Wheat Batter for Dosa and Idli

RECIPE BY MOTHERS KITCHEN ALMERE

INGREDIENTS (PROPORTIONS ARE 2:1:1)

- Feed wheat (with 10% or 11% protein)
- Rice
- Lentils

EQUIPMENT

- Wet mill
- For dosa: a frying pan
- For Idli: an Idli cooker, a poffertjespan [pan for traditional Dutch yeast pancakes] with a lid or a coffee cup

METHOD

The batter

Soak the ingredients for 2 to 4 hours. Add salt and grind them together in a special wet mill. Ferment the batter for 8 to 15 hours (overnight) at a temperature of 29 degrees Centigrade. Afterwards, you can either use it directly or keep it cold in the fridge.

Dosa

Mix the batter well (shake before use). You can add more salt to taste. Heat the pan and add ghee. Pour out one scoop of batter, spread it and fry for one minute on each side; the time depends on the heat.

Idli

Mix the batter well (shake before use). You can add more salt to taste. Heat your idli cooker (it is like a poffertjespan, but bigger). Pour the batter into it and steam for 10-15 minutes. Alternatively: pour it into a coffee cup: pour the batter in and cook it in a microwave for one minute.

Feed Wheat Chapathi (and Puri)

RECIPE BY MOTHERS KITCHEN ALMERE

INGREDIENTS

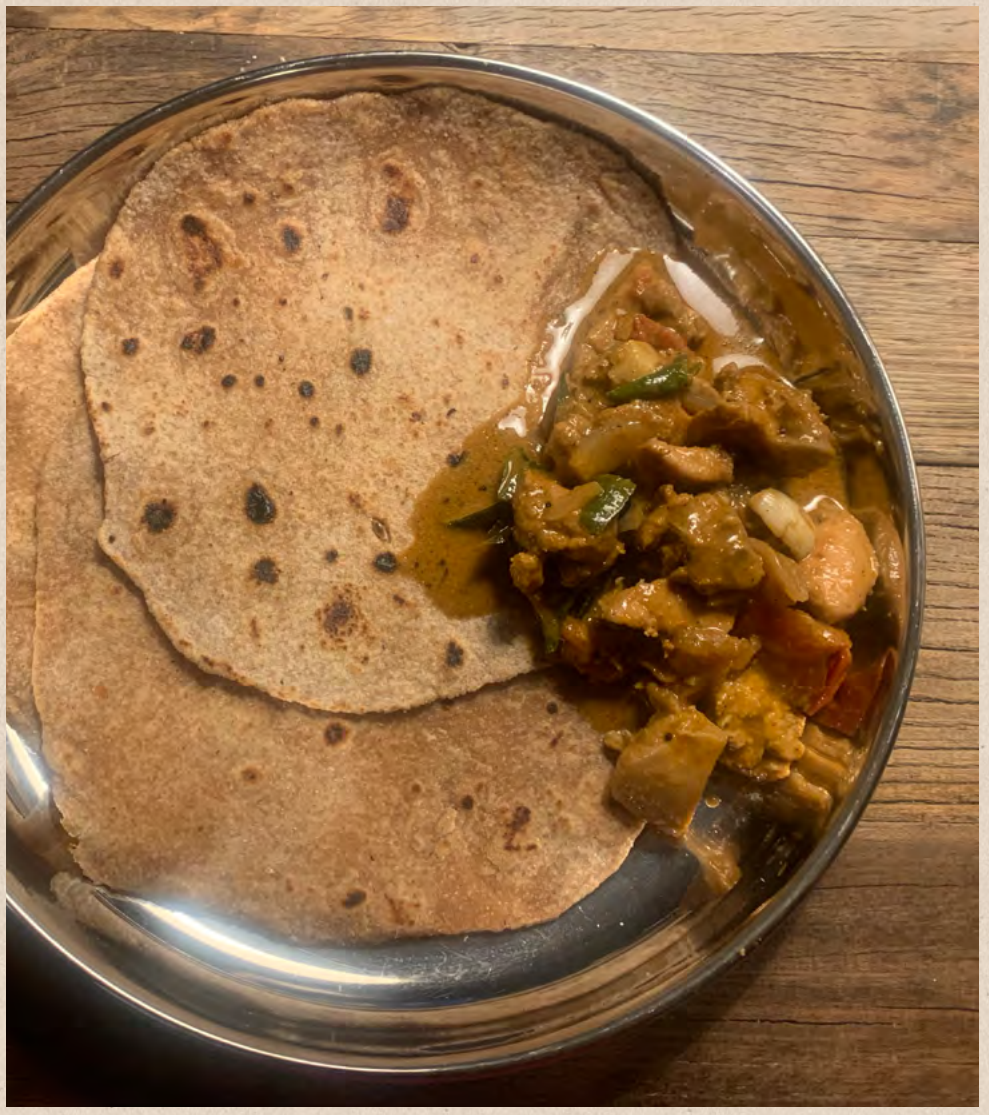
- 1 kg feed wheat (with 10% or 11% protein)
- Salt
- 400 ml water
- Ghee

EQUIPMENT

- Mill (to grind wheat and make flour)
- Tortilla press or a rolling pin
- Pan

METHOD

Clean the wheat (pick it by hand) and grind it in the mill to make flour. Mix the flour with salt (to taste) and add water. You will need about 400 ml of water for 1 kg of flour; however, it depends on how much the flour absorbs. The result should be comparable with a pizza dough. Take a bit of dough and flatten it in a tortilla press or with a rolling pin to a thickness of 2 to 3 millimetres (you can make it thicker if you prefer). Heat a pan and add a bit of ghee, which will give a special flavour. Fry for about 1 minute on each side – no more: the time needed depends on how hot your pan is. 30 seconds could be enough.



low food

hello@lowfood.nl
www.lowfood.nl
Facebook
Instagram
Twitter

Organisation Low Food Grains 2.0
Elzelinde van Doleweerd
(Head of Research)
Sebastiaan Aalst
Anne Foekema
Guus Nelissen
Janno Lanjouw

Participants
Naveen Joby
Pelle Sinke
Loïs Overbosch
Karla Plancarte Solorzano
Tania Pescador

Editor
Laura Emous

Design
Krista Stofberg

Photography
Tess Jansen
Paulus van Dorsten

Partner
This publication is a result of a collaboration between Low Food and Flevo Campus

Special thanks to
Boerderij van de Toekomst
De Graanrepubliek
Ruud Timmer, Wageningen University & Research