UNDER STANDING FLOUR

100 Years of Mühlenchemie

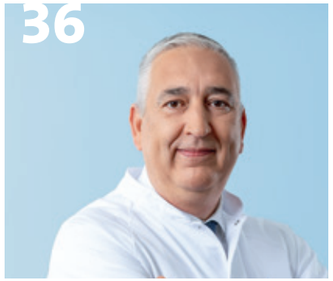
The world of mills
A pictorial tour of the mills of the world.

Torsten Wywiol on values, and why some companies last longer than others.

FlourWorld
Of icemen, flour sacks and goddesses – a visit to the FlourWorld Museum in Wittenburg.

Dr. Matthias Moser on digital dosing, internationalization, and the potential of flour improvement.

Worlds of delight
A raw material for many different tastes.



Peter Steiner on *Understanding Flour* and the best solutions out there.

Technology in practice
A look at the applications and laboratory technology of Mühlenchemie.

Fortification
Mühlenchemie and other heavy lifters in the fight against malnutrition.

Flatbread
New enzyme systems for one of the fastest-growing categories in the food industry.

An incredible Story

It is well-nigh impossible to tell the story of 100 years of Mühlenchemie. But that didn't stop us trying. What came out is a selection of special moments, major milestones, happy coincidences, unpleasant surprises, helpful companions and personal recollections of Volkmar Wywiol.

You'll find this (very incomplete) collection on **10 special pages** about the history of Mühlenchemie. The story is by no means over, but continues into the present and future. It's a part of us, it makes us proud and motivates us, we draw experience and knowledge from it, and we enthusiastically add a little bit more to the story every day.

The world of mills

NIGERIA

Flour from the world over
The port in the metropolis of Lagos, Nigeria, is the commercial centre of the country. Imposing mills line the docks – Flour Mills of Nigeria is one of the largest companies located here. Over 12,000 tonnes of wheat are milled in Lagos every day (by comparison, in Hamburg it's just 1000 tonnes daily).

Nigeria imports almost all of its wheat, from Europe, Australia and the US. Consequently, Flour Mills processes wheat of very different qualities and origins every day. Mühlenchemie enzyme systems make sure that all flours have exactly the desired properties when they leave the door.

Microfine sifting
In the mill, the grain is first cracked and then ground ever finer. After every grinding step, or passage, the particles that are small enough are sifted out as "passage flours." At the end, the wheat flour contains only particles from 10 to 250 micrometres in size.

KAZAKHSTAN

Mill with pasta production

The JSC Zhelayevsky Kombinat Hleboproductov mill processes up to 500 tonnes of wheat daily. A second mill produces only rye flour. The location in Uralsk in western Kazakhstan also includes a pasta factory with three production lines for manufacturers Pavan and Italpast. Combining pasta factories or bakeries directly with mills is a trend that can be seen around the world. At Zhelayevsky up to 2000 kg of pasta products pass along the conveyors every hour, and the lines can make over 30 kinds of pasta in various types of packaging. One of them is the regional Jaima pasta used for the Kazakh national dish Beschbarmak.

In addition to enzymes for flour treatment, Mühlenchemie also supplies solutions for fortifying wheat flour with important micronutrients.

BANGLADESH

Climate challenges
In Bangladesh, mills are built close to waterways. The humidity can reach 95 percent in this part of Southeast Asia, and temperatures of 30°C and higher are common. Storing and processing flour is a huge challenge in this kind of humidity and heat. Under these conditions, flour ages quickly and loses performance. While flour can be stored for six months or more in temperate climates, in Bangladesh it starts to lose quality after just a few weeks. Mühlenchemie enzyme systems help it keep longer, and improve its baking properties.

Muscle power
Flour sacks are stacked high on trucks that arrive at the mill every day by the hundreds. There, the sacks are unloaded by hand.

“We’re a family company that thinks internationally, but acts locally and long term”

Torsten Wywiol
CEO Stern-Wywiol Gruppe

Dear Colleagues, Partners and Business Associates,

100 years of Mühlenchemie – an impressive achievement, and perhaps also a little bit confusing. One hundred years is quite a respectable age for a company! Fewer than 2% of newly founded companies in Germany reach their first centenary, and that percentage is declining. Most companies are already history before what would have been their tenth anniversary. So I would like to thank all who have accompanied us on this long and winding road.

But what do I mean by “confusing”? Mühlenchemie is much older than the Stern-Wywiol Gruppe. A subsidiary that is over twice as old as its parent company? That can happen in business.

When my father bought Mühlenchemie in 1990 the company had already been in operation for over six decades, during which time it brought out several noteworthy innovations, as you can read in the Milestones section. But it was a small operation, as was the Stern-Wywiol Gruppe at the time.

The success and impressive growth of both companies are directly related. The young parent firm benefited from the expertise of the older subsidiary in enzymes and their application possibilities. SternEnzym, which had been founded in 1988, grew by Mühlenchemie’s side and developed successful new products. Mühlenchemie also helped with the successful internationalization of the group. Our entry into fortification came with the founding of SternVitamin, which today makes vitamin and trace element premixes not just for flour enrichment, but also for many other food categories. DeutscheBack creates the link from milling to the baking industry.

The Know-how Connection for ingredients and additives

Today Mühlenchemie has many much younger sisters in the Stern-Wywiol Gruppe. Together they complement each other very well and benefit from each other’s expertise – we call that the Know-how Connection. All are connected with each other, and nobody is alone. We’re a family, and one that looks pretty good. The Stern-Wywiol Gruppe now employs almost 2000 people; we’ve grown to have 12 companies in Germany and 20 foreign subsidiaries, and export to 144 countries for total revenues of €750 million. And we’re nowhere near done yet.

But what’s different about companies that last longer than others? Is there a recipe, or a secret? This is a question you can ask older people, but for a company the answer is always going to be complex. It no doubt takes some luck, enthusiasm and the desire to continually reinvent oneself. Notably, the 20 oldest companies in Germany are or were family-owned. The same goes for the Stern-Wywiol Gruppe. We’re a family company that thinks internationally, but acts locally and long term. Examples include the currently seven Technology Centers we have set up worldwide, and our traveling bakers – it’s always about looking for new ideas with our local partners.

In his book *The Living Company,* former Shell manager Arie de Geus writes that long-lived companies stand out with a sensitivity for developments in their market context, and repeatedly realign their core business. They give their staff freedoms, tolerate exotic experiments outside their core business, and are distinguished by the transparency of their values and the identification of their employees with the company.

It makes me optimistic to see that we have these qualities and live these values at Mühlenchemie and in the entire Stern-Wywiol Gruppe. We’ll continue to celebrate many more anniversaries, as we work together to steadily improve the company to the benefit of our employees and customers, and become a little bit better and stronger every day.

Sincerely,
Torsten Wywiol

“We have to find solutions to problems ever faster”

Dr. Matthias Moser, Managing Director of the Food Ingredients Division, on faster local innovation, the versatility of flour, and future business areas for Mühlenchemie.

One hundred years of Mühlenchemie is an impressive anniversary. As this book shows, this long history has been one of courageous decisions, innovative ideas and most of all heart. Let us also not forget the concentrated expertise of generations of employees. As rich in success as the past was, a look at the present and future is at least as exciting. Mühlenchemie has the right answers for several important future issues. For example, securing a food supply for all despite rising populations, and helping to make our food healthier, more sustainable, and more resource-efficient. Mühlenchemie plays a key role for mills in meeting these challenges, with intelligent ingredients that in very small doses nevertheless make the decisive difference in quality.

Our enzyme solutions enable the production of high-quality, affordable foods from wheat batches with varying degrees of suitability for baking applications. We also improve foods by enriching flours with important vitamins and micronutrients, making them better and healthier. In doing so we make an important contribution to the worldwide fight against malnutrition.

Looking at our sales markets, we predict that the continued rise in prosperity around the world will lead to an increase in the consumption of industrially produced foods. Like the food industry in general, the baking industry needs standardized raw materials that allow the efficient production of foods in reproducible quality. For flour this means compensating for natural fluctuations, and that’s where we come in.

Fast and precisely fitting solutions for our customers

Customers are asking for solutions to their challenges ever faster, while still expecting the accustomed high quality. To meet this demand we are continuously refining our products and capabilities.

One way is by setting up additional Mühlenchemie Technology Centers in our target markets, with expertise in applications technology and rheology. This lets us find the best solutions locally together with our partners and customers.

In addition, through this regional presence and direct contact with locals we get deep and authentic insights into their food culture.

But naturally we also have our eye on digital possibilities. In the future, customers equipped with the right hardware will be able to determine the quality and properties of a wheat right on site, and then use an app to get the appropriate recommended dosage of enzyme compounds from Mühlenchemie.

Independently of that, we continue to invest heavily in the selection and evaluation of enzymes and their synergy effects in our functional complexes. We want to have a complete understanding of these synergies, and use them to the fullest.

We’re also paying increased attention to the non-food category. Flour can already be used as a great sustainable component for items like single-use tableware.

Looking ahead, flour will remain an important and very versatile product, whose share of total agricultural production will rise. In turn, this means that the business of processing grain still has plenty of potential for mills, just as for Mühlenchemie. To leverage this potential, we must resolutely continue on our path of internationalization and applications research.

It makes me proud that as the world market leader for flour improvement, we have achieved such a successful position in worldwide competition. It should be an inspiration to all of us to take the right steps for tomorrow, for the benefit of the globe-spanning milling industry and for people around the world who need healthy, affordable and sustainable foods.

WORLDS OF DELIGHT

A food for every taste

Flour is a fascinating multitalent. For us, *Understanding Flour* means working with customers to improve a natural raw material that can be processed into a limitless variety of nutritious, low-cost foods. The result is a world of delight in many varieties.

PASTA

Fast and good
You can't go wrong with pasta – spaghetti & friends always taste good, regardless of how you cook them and what you combine them with. Pasta generally has only two ingredients, flour and water. Allegedly there are many more than 350 different kinds of pasta, in all sorts of shapes, colours and flavours. The first signs of pasta were found in China, and are over 2000 years old.

CAKES AND COOKIES

Sweet and magical

The Egyptians are thought to have made the first cake with honey 5000 years ago. These sweetened baked goods were used as sacrificial offerings, and magical powers were ascribed to them. Cakes and cookies still taste magically good. Many classic gateaux, biscuits and cookies are made to centuries-old recipes. The undisputed world champion in the consumption of fine baked goods is... Italy! And no wonder – some of the best recipes come from there, like the famous panettone.

WAFERS

Soft or crispy

The discovery of the waffle iron goes back to the 9th century. Today we like soft waffles and crispy wafers, with or without yeast. The ice cream cone is a classic, rolled or moulded. One Ernest A. Hamwi is supposed to have “invented” it in 1904 at the St. Louis World’s Fair. By coincidence, the ice cream stand next door had run out of packaging, so Hamwi helped out with his sugared wafers.

BAGUETTE

Airy and crisp

The perfect baguette should crack audibly when squeezed, and then expand back to its original size thanks to an airy, elastic crumb. The jury of the famed Grand Prix de la Baguette in Paris also considers mass, weight, flavour and colour in picking the winner, who becomes the exclusive purveyor to the Élysée Palace for a year. All told, over 16 million baguettes are baked every day in France. That's more than six billion per year!

FLATBREAD

Flat and versatile

7000 years ago ancient Egyptians heated grain porridge on hot stones to make flatbread, and the idea quickly spread in all directions. Today flatbread is experiencing another boom, since it fits today's young and creative cuisine. Crispy or soft, flatbread is made in all sorts of different ways, and can be combined with any conceivable ingredients, including for vegan eating. This is what makes it so attractive to young eaters in particular.

Small doses, big effects
In flour fortification, a premix of vitamins and minerals is added, generally at a dosage of 200 to 300 grams per tonne of flour. These low amounts cause no sensory or rheological changes in the flour, so the flavour, colour and baking properties remain the same.

For two decades Mühlenchemie has been one of the world market leaders in the production of premixes for flour fortification. These are marketed in over 80 countries under the brand name *ELCOvit*.

Mühlenchemie works closely with its sister company SternVitamin, which specializes in micronutrients for all kinds of food applications. This combination of the vitamin and mineral knowledge of SternVitamin and the flour improvement expertise of Mühlenchemie ensures products and services of the highest quality.

A good micronutrient premix must be tailored to regional requirements and the processes of the specific mill. It must not impair the flavour or baking properties of the flour, and must be stable enough so that the micronutrients remain fully available to people even after transportation and storage. To ensure optimum product quality, Mühlenchemie collaborates with international premium manufacturers like BASF. Mühlenchemie worked with this tradition-rich global company to develop products exclusively for its *ELCOvit* premixes. One example is vitamin A, the most sensitive of the micronutrients, for which BASF developed an innovative encapsulation to ensure that the vitamin remains stable and available, even under difficult ambient conditions like heat and moisture.

Special help for women

Women are the population group most severely affected by micronutrient deficiency, since they need more nutrition during pregnancy and breastfeeding. For this reason, Mühlenchemie, the German Society for International Cooperation (GIZ) and BASF together founded the Affordable Nutritious Foods for Women (ANF4W) strategic alliance in Kenya and Tanzania.

Its goal is to supply women with micronutrients by means of fortified flour and oil at affordable prices. Within the alliance, Mühlenchemie focuses on the fortification of maize flour in cooperation with its long-time partner Sanku. The sustained fortification of maize flour is often more difficult than with wheat flour, since the mills tend to be comparatively small and found in rural areas. To solve this problem Sanku developed affordable dosing systems for small mills and an efficient sales and payment mechanism. Together, the partners have succeeded in raising the use of fortified maize flour in their target regions in Tanzania from three to 50 percent of households, thus contributing to the health of women of child-bearing age and their children.

INTERVIEW

“Mühlenchemie plays an important role in the fight against micronutrient deficiency in East Africa”

Felix Brooks-church, co-founder and CEO of Sanku, on the reasons for micronutrient deficiency, and how small things can bring about big changes.

Mr. Brooks-church, the initiative you founded fights micronutrient deficiency. How does this happen locally in practice?

Felix Brooks-church: Let’s take maize in East Africa as an example. Most of the population relies on small mills for their supply of maize flour, which is a regional staple. Working with the small rural mills is one of the best strategies for food fortification. Although enabling small mills to fortify flour can play a key role in eliminating micronutrient deficiencies, typical fortification schemes focus on the large mills. Small mills can’t afford additional nutrients, and conventional fortification technology is unsuitable for these mills and their very decentralized rural settings. In Tanzania, for example, 93 percent of the population eat maize but only 3 percent have access to fortified maize. These shockingly low numbers, which are repeated throughout East Africa, reveal the gaps in the current fortification model. Millions of undernourished families are thus excluded from one of the most effective nutritional improvement measures.

How can the problem be addressed?

We developed the patented “Sanku Dosifier” fortification technology. This device can easily be installed in the thousands of small mills in East Africa. It’s robust, internet-capable, and has remote monitoring functions that let us capture important data in real time in a very decentralized sector with no infrastructure.

What contribution can companies like Mühlenchemie make to better nutrition?

Mühlenchemie plays an important role in the fight against micronutrient deficiency in East Africa. It developed a nutrient mix specifically for the needs of the small mills here. While Mühlenchemie normally provides premixes in larger package sizes, through our partnership we have the option of buying them in smaller packages. Furthermore, thanks to the partnership we’ve been able to expand our programme in Tanzania and make fortified flour available to endangered population groups. Support from Mühlenchemie, for example a donation of €50,000, enabled the installation of 29 Sanku Dosifiers in small mills in Tanzania. We are very grateful for this help.

The Sanku Dosifier

The Dosifier works like an electronic scale. It consists of a premixing device and a weight-dependent grain funnel. The funnel rests on four scale cells that measure the weight loss as the grain is filled into the mill. The weight of grain flowing into the mill triggers a simple, robust electronic control that activates the Dosifier, which adds a defined amount of nutrient premix by means of a feed worm. The grain and premix are thoroughly combined.

Sanku monitors the miller’s use of the Dosifier by means of a wireless link to the machine. This permits remote detection if the Dosifier needs to be repaired, or when micronutrient premixes and empty flour sacks need to be refilled.

Wheat flour is getting scarce in some regions – but why?

Because of the war in Ukraine two of the world's largest wheat producers have stopped exporting, at least partially. Africa was a big importer of Ukrainian wheat, and now those shipments are lacking.

Supply and demand
When demand exceeds supply, prices go up. Only a few days after the start of the war, world market prices for wheat rose by over 30 percent.

€ 290
The price of wheat per tonne in 2022
On the Paris futures exchange (MATIF) before the war

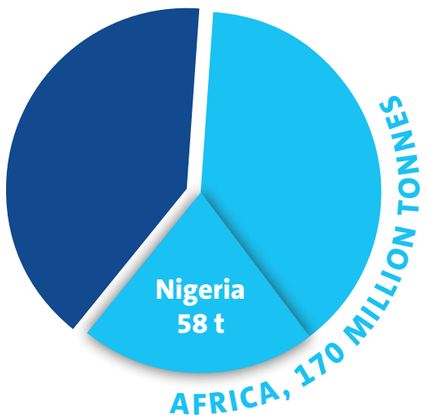
2021
3,400,000 t
The amount of wheat exported by Ukraine in August 2021

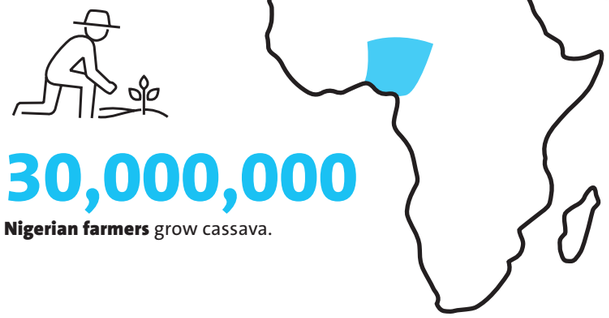
€ 400
The price of wheat per tonne in 2022
on the Paris futures exchange (MATIF) after the start of the war

2022
937,000 t
The amount of wheat exported by Ukraine in August 2022

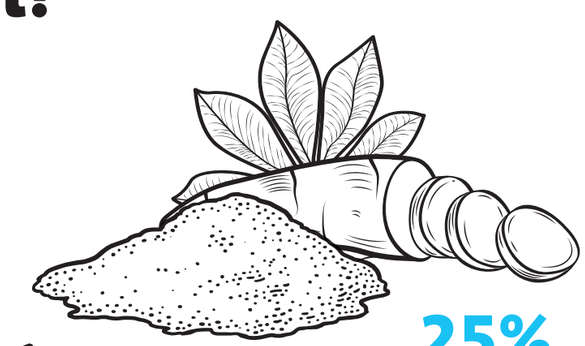
It doesn't always have to be wheat!

Worldwide cassava production in 2018





30,000,000
Nigerian farmers grow cassava.



25%
Percentage of cassava in the composite wheat flour for a pasta which most respondents in a survey liked.

Rice
Rice flour is a well-proven wheat substitute. It is also available worldwide, so it has great potential for composite flour.

Soy
Used mostly for animal feed, this bean has one of the highest protein contents of any crop, as well as containing many vitamins and minerals. In cake, soy can replace up to 30 percent of the wheat, with good results. Soy is grown around the world, but mostly in the Americas and Asia.

Sorghum
This millet variety is an important grain in Africa. It is gluten-free and rich in protein, vitamins and minerals. Since it is heat- and drought-tolerant, it is being planted more and more in temperate zones as well.

Cassava
This starchy root, also known as manioc, is one of the most important staples in Africa and other tropical regions. Nigeria is the world's largest producer. Cassava can be used in composite flour for many purposes, like as bread, biscuits and cake.

Maize
Maize is the most important crop in Africa and in many developing countries elsewhere. In Africa, one out of every five hectares of agricultural land is planted with maize, and it is the main source of food for over 300 million people. Due to its white colour, African maize is ideal for composite flour for sandwich bread.

A bread with a thousand faces

From flour, water and salt, bakers around the world conjure an incredible variety of regional specialities just by means of small recipe differences and processing finesse. Here we present the most popular versions.

Naan
These elongated breads are eaten in many regions. In Kazakhstan naan is a yeast bread leavened with yogurt. It is stretched out before baking, leaving an edge that is thicker than the inner part. In India, Pakistan, Afghanistan and the Gulf region naan is traditionally baked on the hot inside walls of a clay tandoori.

Parathas
A delight of many dough layers that looks and tastes like a mix of flatbread, strudel and puff pastry. Sometimes little pieces of cooked potato or cauliflower are mixed into the dough. Paratha is a popular street food in South Indian states like Kerala and Tamil Nadu.

Bhatura
This fried, balloon-like flatbread is popular in the north of India and in Pakistan, for example for breakfast with a strong chickpea curry.

Chapati (roti)
These thin, unleavened flat pieces of dough are prepared in a heavy iron pan. In the purist version the dough consists only of flour and water. But a little oil and a pinch of salt give the chapati more flavour. After baking, ghee or butter is often brushed onto the surface. Chapati is a staple on the Indian subcontinent and in East Africa.

Pita
Yeast-risen wheat dough is baked at over 450°C, causing the crumb to separate in the centre and form a gap. This can then be filled with shawarma, falafel or hummus as desired. In Saudi Arabia, khubz is the undisputed king of pita varieties, and the secret star of every mezze (appetizer) spread. As a rule, it is made of wheat flour with a high extraction rate, and has a soft, slightly leathery consistency.

Focaccia
This soft, fluffy flatbread from Italy is spread with a marinade of garlic, olive oil and herbs before baking.

Yufka
A Turkish delicacy – paper-thin unleavened bread baked on a convex iron plate until aromatic brown spots form.

Laffa
This Israeli speciality originated in Iraq. A yeast-raised bread with a high proportion of crumb and a bite on the tough side, it is essential to the sabich, a popular sandwich with fried aubergine, tomato and tahini.

Lavash
These thin breads are sold on every street corner in Armenia. Baking them on the inside walls of a clay oven takes a lot of manual dexterity. In a minute or less the dough forms blisters and the sheet has to be removed quickly with an iron hook. Warm lavash has a soft consistency, but it turns crispy when it cools.

Lepeshka
Popular in Uzbekistan, Kazakhstan and Tajikistan, lepeshka is baked on the wall of a tandoori and eaten hot. The typical patterned middle doesn't rise during baking, so, unlike the thick edges, it gets crispy. It features a golden crust and soft, often very light-coloured crumb. In Uzbekistan no meal is complete without it.

PASTA

Kitchen's darling across the world

Cheap, long-lasting, simple to prepare and versatile – pasta is just right for today's lifestyles. These boiled dough products are eaten the world over in all sorts of ways. Mühlenchemie enzyme systems keep pasta quality dependably high regardless of the properties of the grain; boiling-stable pasta can even be made from soft wheat, an important innovation for the economical availability of pasta.

“Joint research leads to very creative ideas”

When a German and an Italian family company combine many decades of experience and expertise, the results are sure to be exciting. Luigi Fava manages Italy’s leading pasta machine maker in the third generation. We talked to him about the world markets and the special research cooperation with Mühlenchemie.

Luigi Fava, CEO of Italian pasta machine maker Fava. His grandfather founded the company.

Mr. Fava, what major challenges do you see in your markets?
Luigi Fava: Getting the best possible pasta quality from the materials available in specific markets is one of the biggest challenges. With regard to energy sustainability and effects on the environment, we need to substantially reduce the heat and electricity consumption per kilo of pasta, without making compromises in flexibility, workability or user friendliness. With regard to our products, we want to offer customers added value and increase the service life of our machines.

How is your company addressing these challenges?
With research and development, which has always been our focus. For example, drying is fundamental! We’ve developed new drying methods with temperature modulation in order to make perfectly dried pasta with substantially higher boiling stability, even if made with flour of lower quality.

What kind of flour are you talking about specifically?
Soft wheat is used worldwide in great quantity. Its quality is often not up to the minimum requirements for making high quality pasta. But with our technology we can still get remarkable results and noticeable improvements. The increased consumer interest in foods with higher nutritional value has also spurred pasta makers to use unconventional materials. Today there is a wide array of ingredients that can be added to pasta, including fibre, legumes, rice, maize, micronutrients, sea algae and much more. You can eat pasta with cricket powder in it if you want to! Our processing technology also enables the production of high-quality gluten-free pasta for sensitive and celiac consumers.

What technological innovations are you driving?
We’ve implemented digital technologies around Industry 4.0, with a special focus on the industrial Internet of Things, augmented reality and predictive maintenance based on artificial intelligence and machine learning.

How do you do research and development at Fava?
We just opened a brand-new 1000-square-metre laboratory, where we develop efficient technologies for further education, and for the chemical, physical, qualitative, sensory and rheological analysis of flours and finished products. We also research new raw materials and pasta products for our customers.

In what regional markets do you see the biggest opportunities?
Fava exports 90 percent of its pasta lines. We deliver to over 70 countries. The markets in Africa and the Near East, where Fava has also installed very efficient couscous lines, are growing quickly. In Italy, Fava can be found in the most important and well-known pasta factories, and about 80 percent of the systems installed are from us.