

# THE PRICE OF CHEESE



TEXT BJÖRN THEIS

Whether it's Gouda, Emmentaler, mozzarella or Parmesan, cheese is a food that has been eaten daily by many people for thousands of years. It's versatile, durable, delicious, and rich in nutrients. But the way it is produced could change in the future

**T**he world loves cheese—and pays a high price for it. Not only at the market stall or the delicatessen counter, but also in terms of the environment. More than 210 million tons of cheese are consumed annually all over the world. Global milk production accounts for an estimated 2.7 percent of all anthropogenic greenhouse emissions. Besides, for the production of cheese more acreage is needed per kilo of end product than for most other kinds of food. Lots of water—about 5,000 liters—is needed as well. Apart from that, just over a third of all people are able to enjoy eating cheese. The rest of the global population suffers from lactose intolerance. It's high time to find new ways of producing this food more sustainably.

## A GIFT OF THE GODS

Human beings' preference for cheese is immemorial. According to one legend, people were offering fresh milk as a sacrifice to the gods of Mesopotamia as early as 3000 BC. This milk remained on the gods' altars for days and was slowly transformed into sour milk cheese. A priest sampled this white mass, was astonished, and concluded that this food must be a gift of the gods. It's probable that cheese was already known during the Neolithic period, about 5500 BC. In what is today Poland, archaeologists have found fragments of a strainer made of clay with traces of fatty acids from milk sticking to it. These residues prove that this household utensil was used to drain off whey for cheese production.

Cheese has been mass-produced at least since the nineteenth century. Back then,

the basic research done by scientists such as Louis Pasteur and Justus Liebig revealed the roles played by microorganisms in cheese production and laid the foundation for the industrialization of the process. The basic material of every kind of cheese is casein, a specific mix of proteins that is found in milk. This substance exists in every kind of milk, whether it comes from a cow, a reindeer, a sheep or a goat. With the help of microorganisms, the casein is separated from the watery whey and then processed further to make the various kinds of cheese.

## NO MORE MILK

As long as cows are used for casein production, it will be nearly impossible to come to grips with the CO<sub>2</sub> problem. But the good news is that in the future casein could be produced by a different method that is much more compatible with the environment. For example, the US startup New Culture has developed a process for producing casein by means of fermentation—that is, with microorganisms but without any milk whatsoever. The company plans to launch its first product on the market—the first genuine mozzarella that is free of animal products and lactose—in 2023.

The Israeli company Remilk is going one step further in an effort to produce milk without involving cows—also by means of fermentation. The results achieved so far are promising and have even convinced the cheese producer Hochland to invest in the enterprise. The company owners believe that vegan milk is a sustainable alternative to today's raw material. Their production process requires only one percent of the

acreage, four percent of the raw materials, and ten percent of the water that is needed for traditional milk production. What's more, in culinary terms their product is superior to "analog cheese," which has for many decades made the expensive ripening process unnecessary due to additives such as palm oil, starch, emulsifiers, and aromatic substances.

## SUSTAINABLE NUTRITION

It will be quite a while before the world no longer needs any more cows in order to produce the millions of tons of cheese and billions of liters of milk that we consume. Nonetheless, the market for lactose-free and plant-based milk substitutes is growing by leaps and bounds. According to estimates, the market volume of alternatives to milk will be worth almost US\$41 billion in 2026. That's a good reason for the Foresight team at Creavis to conduct deeper analyses of man-made milk and casein within the framework of this year's focus theme, "Sustainable Food Futures 2040." And who knows? Perhaps one day we'll have a plant-based cheese that would even delight the gods of Mesopotamia. —



**Björn Theis** heads the Foresight department at Evonik's innovation unit Creavis. His *ELEMENTS* column appears regularly at [elements.evonik.com](https://elements.evonik.com)