

The golden opportunity of beer for increased sustainability

DTU Brewery brews beer in new ways for the benefit of the environment, and - among other things - has examined how you can skip the malting process by adding enzymes and thus save on CO₂. The nutritional products contained within the side streams are also used in new and profitable ways. And you can even drink a beer made from leftover rice when sushi is made in the city of Lyngby.

DTU Brewery has examined how to skip the malting process and brew beer solely from barley - because it requires a lot of energy to convert barley to malt. First, the clean barley is soaked in water. Then, it must sprout under 100 % humidity. Finally, it must dry at a high temperature.

When you skip the malting process, the necessary enzymes in the barley are not activated for later use in the brewing process. To compensate for the lack of active enzymes that would usually be present in the malt, DTU Brewery instead adds industrially manufactured enzymes from Novozymes, Ondea Pro.

When you skip the malting process, the CO₂ emission is reduced by 8 % in the total brewing process, corresponding to 8.4 grams of CO₂ per bottle.

Better utilization of the side streams from beer

The production of beer leads to a number of side streams, which is really another word for a residual product that we today focus on using instead of discarding. Brewers' spent grains - crushed malt extracted in water - are an example of a side stream. In the efforts to make the DTU Brewery more sustainable, the brewers

have developed a compact filter that makes it possible to utilize nutrients in the spent grains in a financially viable way.

The spent grains contain lots of fibre and approximately 6 % of the protein that is found in the raw materials. With extraction, the protein can be used in the production of enriched foods etc.

The idea of using spent grains in the production of food is not a new idea. However, until now it has not been financially viable to dry the mash. The newly developed technology makes it possible to separate the mash gently and cheaply into two parts through filtration and simultaneous pressing: one part liquid, and one part dry matter. The dry matter then undergoes a final drying or acidification process. Now the fibre-rich substance can be used e.g. in bread to make it more fibre-rich. The liquid is acidified or pasteurized and can be used to produce light beer or foods. Even the residues in the liquid, which contain proteins, sugar, and antioxidants, can be used to enrich milk products and protein drinks etc.

The technology is based on innovations developed and patented at DTU Brewery, which are being commercialised.

DTU Brewery in the National Food Institute conducts research into brewing techniques and brews beer by e.g. skipping the malting process and using up to 100 % barley with the addition of enzymes during the brewing process. This reduces CO₂ emissions.

Beer. Colourbox

Sustainable beer from DTU Brewery

DTU Brewery is an incubator for innovation and new thinking at the National Food Institute. The Brewery is working to develop a sustainable brewery based on the latest technologies and interdisciplinary research. Students, employees, and the industry are working across disciplines to try out new ideas in practice and to conduct projects that involve all links in the production chain – from raw material to end product.

DTU Brewery is a non-profit brewery, which can brew beer from laboratory scale to test plant level up to 250 litres.

The size of the Brewery makes it possible to create results that are relevant to the industry. Being situated at a university allows for the basic principles of brewing to be explored, and makes it possible to initiate projects that can be commercially risky or not yet financially viable for commercial breweries. Here, the focus is on minimizing the consumption of resources in the brewing process and on developing new sustainable processes and products. The Brewery can do so by combining and optimizing technologies without compromising on the quality and shelf life of the products.

DTU Brewery collaborates with small and large breweries and with the associated industry such as enzyme manufacturers.

Put rice in the beer, not in the rubbish bin

Sushi and beer rarely make for a bad combination. And it is even possible to order sustainable draught beer made from the rice which Sticks'n'Sushi in Lyngby has left over after making sushi. Researchers from the National Food Institute have made that possible.

Sticks'n'Sushi cooks up large quantities of rice for its sushi production. Rice that isn't eaten ends up being drunk instead. The restaurant chain had help from the Institute to reuse the rice in a beer, which is specially developed for the chain's guests. The beer is called Gohan Biiru – which simply means rice beer – and it is brewed by the spinout company, Science Brew.



The National Food Institute is working to utilize residual products from the production of food such as surplus sushi rice to quench the world's thirst for sustainable beer.

© Rice. Colourbox

In Denmark, we mostly brew beer from barley. However, there is already a number of beers – especially Asian beer – made from rice on the international market. Brewing the Danish rice beer has not been easy. Rice is rich in starch and in large quantities tends to block the filters in the beer production in a way that grain-based mash does not.

However, Science Brew solved the challenge allowing the beer to flow. First, they succeeded in brewing beer in a scale of 10 litres, which consists almost entirely of surplus rice and water and a little malt. Science Brew has converted this recipe so that it can be used to brew beer on a much larger scale. At the moment, Gohan Biiru contains approximately 20 % of the malt substituted with boiled excess rice, but Science Brew expects to increase the rice content even further.

The beer is served as draught beer at Sticks'n'Sushi in Lyngby as it is less sustainable if bottled. In the long term, the restaurant hopes to put Gohan Biiru on its menu in all its restaurants.

“The ambition is to apply side streams, which has broad perspectives. The clever thing is that the side stream – e.g. spent grain from beer production – is already a food. This means that the side stream can be used directly without undergoing comprehensive authorization procedures, as would be the case with a novel food. When we can easily use side streams in this way, we can utilize the resources in a much better way and thus save CO₂ and the amount of land used for agriculture. At DTU Brewery, we hope that breweries worldwide in the long term will implement the techniques developed at the National Food Institute. Seen in isolation, we do not believe that we are able to save the whole world with sustainable beer. However, beer is just a small piece of the puzzle that can save the world – together with thousands of other small pieces.”

Tim Hobley
Associate Professor