

ABOUT 100 PER CENT BARLEY BEER

Comparative life cycle assessment of malt-based and barley-based beer

Drinktec 2009 saw the launch of Novozymes' latest solution, Onda Pro®, an innovation that enables the production of 100 per cent barley beer – and it does this while reducing CO₂ emissions from beer production (incl. all upstream processes and primary packaging) by 8 per cent.

Through using barley as the only raw material for extract, Onda Pro helps brewers overcome many of the challenges facing the brewing industry in recent years. It helps optimising raw material utilisation, improves productivity, facilitates the creation of new beverages and empowers brewers to get sustainable – all while maximising from the consistent quality and flexibility offered by barley.



Barley beer acts as a platform to develop new flavoured beverages or as a stand-alone, sustainable and socially responsible product. As the customisation of the blending of barley beer can take place at a late stage, this significantly reduces the time for reformulating existing brands. Barley beer made using Novozymes' solution was rated highly during taste tests completed by professional taste panels and through consumer surveys completed in Denmark and Germany.

The professional taste panels in Weihenstephan and Leuven rated the barley beer as a regular pilsner type beer with high results and none of the panels detected discernible beer faults or off-flavour. The consumers could not taste the difference between a beer made on barley and a beer made on malt and expressed a strong interest and an openness to try a barley-based beer.

Socially responsible and sustainable

Consumers are constantly growing more environmentally aware and more conscious of the impact that industry and consumption has on the environment. Ondea Pro enables a simple switch from malt to barley and instantly reduces the carbon footprint associated with beer production. This means brewers can offer their customers a product produced to a high ethical standard and that supports their corporate social responsibility goals.

Jesper Hedal Kløverpris

Life cycle assessment specialist, Novozymes A/S; Reference: Jesper Hedal Kløverpris, Niels Elvig, Per Henning Nielsen, Anne Merete Nielsen, Oliver Ratzel and Akos Karl (2009): Comparative Life Cycle Assessment of Malt-based Beer and 100 per cent Barley Beer.

<http://www.novozymes.com/NR/rdonlyres/5D89A1D2-05CD-4D1B-B1C0-791EF869034F/0/BarleyBeer.pdf>



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It is possible to reduce 2.5 kg of CO₂ per hl of beer produced and use considerably less land to produce the same amount of beer. Local farmers benefit also from supplying breweries which in turn supports social responsibility targets. Through using locally grown barley, brewers avoid importing malt and this reduces the carbon footprint even more.

Optimisation of raw material utilisation

Limited access to raw materials has led to rising prices and this has caused brewers to look for flexible and effective alternatives that do not jeopardize the consumer's experience. Ondea Pro helps purchasing agents achieve their sourcing objectives. A 7 per cent saving in the amount of barley required to produce a hectoliter of beer from 100 per cent barley versus 100 per cent malt.

Life cycle assessment

Life cycle assessment is an environmental assessment tool which addresses all processes in the production chain of a product. Life cycle assessment has been used to document the environmental benefits of barley brewing at Harboes Brewery. See Kløverpris et al. (2009).

The study compared environmental impacts caused by producing and delivering Ondea Pro to the brewery with the avoided environmental impacts achieved by by-passing the malt production.

The company uses micro-organisms to produce the enzymes contained in Ondea Pro and all significant processes at Novozymes' and at Novozymes suppliers' and sub-suppliers' etc. were included in the assessment. Malt can be produced from several grains and the study addressed barley malt and included all significant processes in the malthouse



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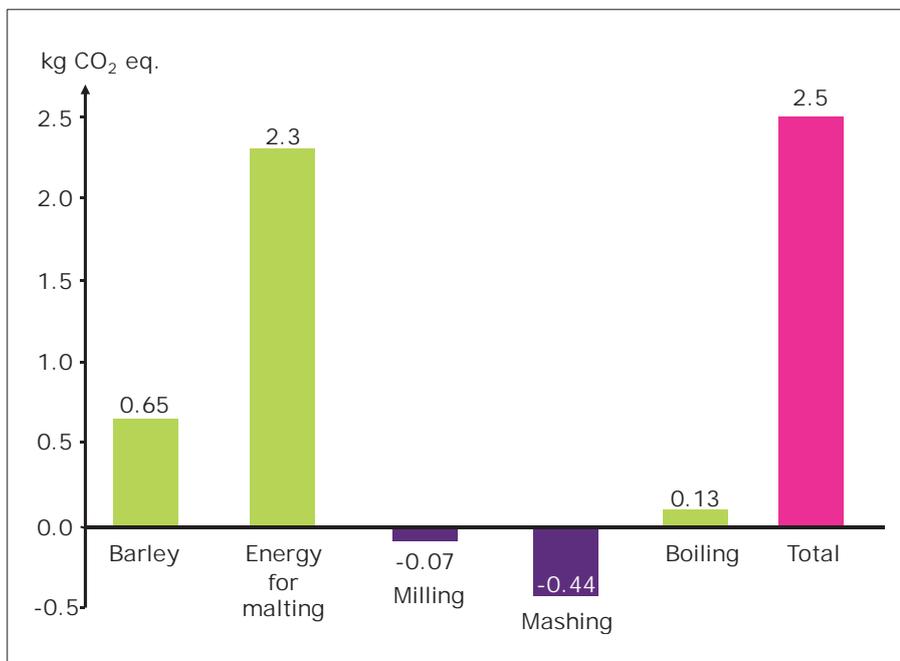


Figure 1: Disaggregated results for global warming. Positive bars represent net reductions of contribution to global warming and negative bars represent net increases of contribution to global warming. 'Saved barley' represents the net saving in barley consumption. 'Energy for malting' is an aggregate of saved heat, electricity and water in the malting process. 'Milling' represents additional electricity used in the milling process. 'Mashing' is an aggregate of added enzymes and energy saving for heating in the mashing process. 'Boiling' represents saved steam in the boiling process.

and in production of the barley: i. e. ploughing and fertilising the field and harvesting the grain etc.

It was found that 30 gram Ondea Pro used in production of one hectoliter beer saved around one Nm³ natural gas and one kilogram barley. The natural gas was saved because the malting (including malt drying) became redundant and barley was saved because the barley loss during germination was avoided. In addition

some water and electricity was saved.

Production of 30 gram Ondea Pro etc. caused an emission of around 0.8 kilogram CO₂ but more than three kilogram CO₂ emission were avoided because of the avoided natural gas combustion and the avoided barley production (see figure 2).

The production of Ondea Pro is dependent on an input of sugar and agricultural land is indirectly used to produce the enzyme.

The amount of agricultural land used is very small (less than 0.1 m² per year) and much smaller than the land saving achieved by reducing the barley used per hectoliter beer (more than 2 m² per year) (see figure 2).

Energy saving in the malting factory was the most important factor for the CO₂ saving obtained by using Ondea Pro, but barley saving also contributed considerably (see figure 1). A small energy saving achieved by reduced mash boiling requirement was nearly negligible.

Extra electricity consumption for milling the hard barley grains instead of the more soft malt explains a small additional CO₂ emission from the milling process. Ondea Pro is added to the mash and this explains most of the CO₂ emission related to the mashing process. Transport of enzymes and barley turned out to be unimportant for the overall result. Results in figure 2 are a simplification of results in figure 1 and the two figures cannot be compared directly except for the totals. Details can be found in Kløverpris et al. (2009).

As demonstrated by Novozymes' LCA, Ondea Pro not only makes a good tasting beer, but reduces the amount of CO₂ per hectoliter of beer produced. In a recent consumer study, 75 per cent of respondents based in Denmark stated a preference for beer made from barley with a CO₂ claim and only 5 per cent preferred a similar beer made from malt without a CO₂ claim, while 22 per cent had no preference. □

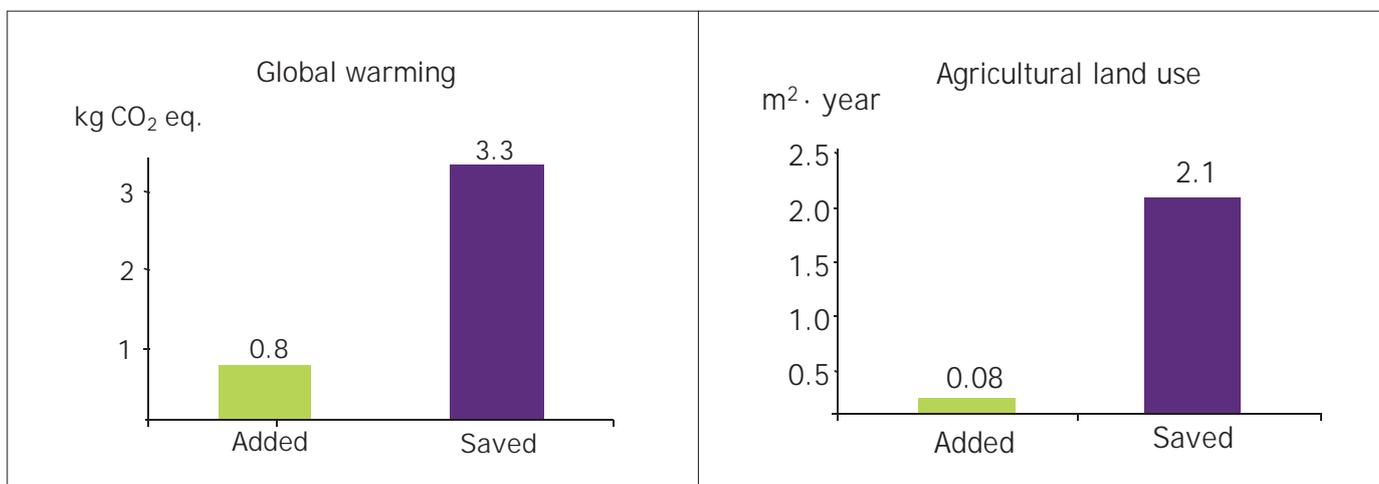


Figure 2: Added and saved environmental impacts when 100 per cent barley brewing replaces conventional brewing. Added impacts are primarily due to Ondea Pro production. Saved impacts are primarily due to avoided barley production and avoided energy consumption in the malting factory. All data are per hectoliter of beer at the gate of the brewery.