

## Hveiti - the sustainable biorefinery of tomorrow

Hveiti's mission is to create growth and development through the production of sustainably produced food, feed and bioethanol.

The Danish development company DBH Technology A/S started the project with the vision of creating a sustainable alternative to fossil fuels.

The fundamental idea is that the biorefinery at Grenaa Harbor should be a practical example of a sustainable production with an optimal resource use, where all parts of the feedstock are used, leaving no waste products.

DBH Technology's goal is to help create a general change in attitudes towards the future approach to resources, production and sustainability, so that we in Denmark and internationally become better prepared to meet the future challenges within food, feed and energy.



### Fundamental idea

The fundamental idea is that if we are to do something about climate change and the rising demand for food, we have to change our attitude to the way we consume the Earth's resources.

In short; we have to focus on an optimal use of the resources available to us.

*Hveiti is the Old Norse word for wheat.*

See Hveiti's short animated video which presents the production concept on:

[www.hveiti.dk/en/video](http://www.hveiti.dk/en/video)

and follow hveiti on

[www.facebook.com/hveiti](https://www.facebook.com/hveiti)



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## *An intelligent solution*

*to the future food, feed and energy challenges*

**Macro algae -**

**future potentials within the  
biorefining industry**



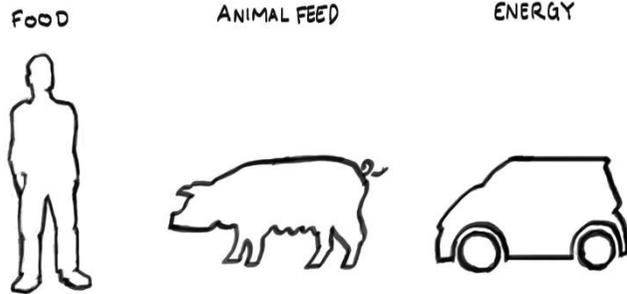
## Biorefining

Biorefining is an intelligent solution to the future challenges within food, feed and energy.

Through a biorefining process you get:

- More out of the global land and water resources.
- An optimization of the feedstock's utilization degree, because in a biorefining process, all parts of the grain are used, and not only the parts that are available on the surface.

In this way, Hveiti will produce food (fibers), feed (protein) and energy (bioethanol).



Bioethanol from Hveiti has a CO<sub>2</sub> reduction capacity of 70 % compared to regular gasoline.

Thereby, Hveiti has no problems meeting the demand of the Renewable Energy Directive, which states that all plants must have a CO<sub>2</sub> reduction capacity of minimum 35 %.

From 2017, the requirement is raised to 50 % for existing plants and 60 % for new plants.



## Feedstock choice

Hveiti's production concept is developed against the backdrop of Danish conditions and local advantages. Therefore, Hveiti will use feed wheat as feedstock in the production of fibers, protein and bioethanol.

*Less than 5 % of the wheat cultivated in Denmark is used for food. This is due to climate- and cultivation conditions which cause a high amount of starch that makes the wheat unsuitable for baking.*

By biorefining feed wheat produced in the EU and using it for fibers, protein and bioethanol, instead of importing it from South America, you free up agricultural land in these areas.

## Macro algae - the future biomass

At Hveiti we constantly follow the development within biomass, and especially the development within blue biomass is interesting.

If we, in the future, change our attitudes towards areas of cultivations and dare to think differently by e.g. including the ocean as an area of cultivation, there are great possibilities for the cultivation of macro algae (seaweed) in Denmark. And like feed wheat, macro algae are very suitable for biorefining.

Recently, there has been a development within the production of macro algae. Small scale productions already exist in Denmark, and research projects have been established.

From a biorefining perspective, there are many advantages in using macro algae as feed stock:

- Several brown algae species are particularly suitable because of their high amount of carbohydrates, which makes it suitable for the production of bioethanol or biogas.

- The biomass return from macro algae per hectare is larger than the return from traditional energy crops.
- Preliminary tests show that macro algae are suitable for feed mixtures in the animal husbandry. This means that the remaining mass from the energy production can be used as a high-value protein to be mixed with animal feed, just like winter wheat.
- Preliminary tests show that the content of amino acid and omega3 found in brown algae makes it suitable for feed and especially the rising fish production. An alternative to today's use of minnows in feed mixtures for the fish production is strongly needed.



## Challenges within the biorefining of macro algae

The potential is huge, but there are still challenges connected to the use of macro algae.

- In relation to a Danish production, we still have not seen the full potential, as we need documentation for the production potential and the handling - like drying and storage - of macro algae.
- An enzyme needs to be developed to make possible the fermentation of macro algae's structural carbohydrates, which are very persistent.
- A better description of the market for refined products is needed.