



To get around this problem, biofuel is now produced from non-food biomass including agricultural residues, land-based energy crops such as fast-growing trees and grasses, and aquatic crops such as seaweed and microalgae.

All of these feedstocks have their challenges, especially those that are land based. At least part of the issue is the fact that crops for biofuel could potentially displace crops for food.

However, seaweed offers all of the advantages of a biofuel feedstock with the additional benefit of growing, not surprisingly, in the sea.

### Scaling up

But turning big pieces of slippery, salty kelp into biocrude is a challenge, too. Some studies have used catalysts, which are added chemicals that can help make the process go more quickly or easily. However, catalysts are normally expensive and require catalyst recovery.

The UK study that resulted in a 19 percent yield used a catalyst in its process.

Tran says the advantage of his process is that it is relatively simple and does not need a catalyst. The high heating rate also results in a biocrude that has molecular properties that will make it easier to refine.

But Tran's experiments were what are called screening tests. He worked with batch reactors that were small and not suitable for an industrial scale. "When you want to scale up the process you have to work with a flow reactor," or a reactor with a continuous flow of reactants and products, he says. "I already have a very good idea for such a reactor."

### The outlook

Even though the preliminary tests gave a yield of 79%, Tran believes he can improve the results even more. He's now looking for industrial partners and additional funding to continue his research.

 [Kelp can be turned into a kind of "bio-crude" that can be further refined into a biofuel. \(Photo: Rune Petter Ness, NTNU Communication Division\)](#) [5]

 [Kelp grows abundantly along the Norwegian coast, and can also be ?farmed?. \(Photo: Mentz Indergaard, NTNU Communication Division\)](#) [6]

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[Gemini, NTNU Trondheim - Norwegian University of Science and Technology](#) [8]

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