

North Sea Weed a chain approach Physiology of Seaweed



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The growing global demand for food, energy and raw materials, puts an increasing claim on the land with its relatively scarce resources. A contribution from the sea with its unused resources is obvious, but requires a multidisciplinary approach for a sustainable and profitable solution. With the establishment of a seaweed chain a contribution can be made to the above-mentioned demand. in close cooperation Dutch TO2 institutes are equipped and prepared to make a success on a large scale, feeding on the experience they have already gained on small scale research. During and after this project TO2 consortium aims to involve private parties for investments in future research and thereby an investment is made into a more sustainable society.

The goal of this project is to develop an environmentally sustainable and economically viable seaweed chain design. In order to reach this goal an essential tool has been identified which is the multidisciplinary collaboration in different fields of expertise; the physiology and growth of seaweed through processing and marine engineering at sea.

Two seaweed species were selected based on their ability to grow in different seasons (summer and winter) and their valuable constituents. The green alga *Ulva* sp has its main growing season in summer and contains relatively high levels of proteins, while the brown alga *Saccharina* sp. grows in winter and has relatively high levels of carbohydrates. A number of growth experiments were carried out to determine production rates and to study effects of harvesting frequency on production rate and chemical composition. The first steps were taken in determination of the lowest possible harvesting frequency that will not compromise production rate or content of valuable constituents. Knowledge on the frequency is needed for development of an economically feasible production system.

No significant differences in production rate between harvesting *Ulva* once every week or once every three weeks were found. Less frequent harvest means less trips with the harvesting vessel. When using a year-round seaweed production system, including the green seaweed *Ulva lactuca* and the brown seaweed *Saccharina latissima*, a total production of max. 35 t ds ha⁻¹ can be achieved. In addition, the experiments provided data for validation of the model developed to estimate spatial aspects. This included production rates and nutrient uptake rates. With these data the model can predict production rates and environmental impact for different locations in the North Sea. Furthermore, it can be calculated at which size of the farm local nutrient depletion will occur. And finally, the experiments provided data on chemical content of the cultured seaweeds. The experiments indicate that the culture system has an effect on the nitrogen and glucose content of *Ulva*.

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Background

- Global demand for food, energy and raw materials grows
- Claim on land with its relatively scarce resources increases
- Consortium of Dutch TO2 institutes aims to develop an environmentally sustainable and economically viable seaweed chain through production, processing and marine engineering at sea
- o Involvement of private parties for investments in future research is foreseen

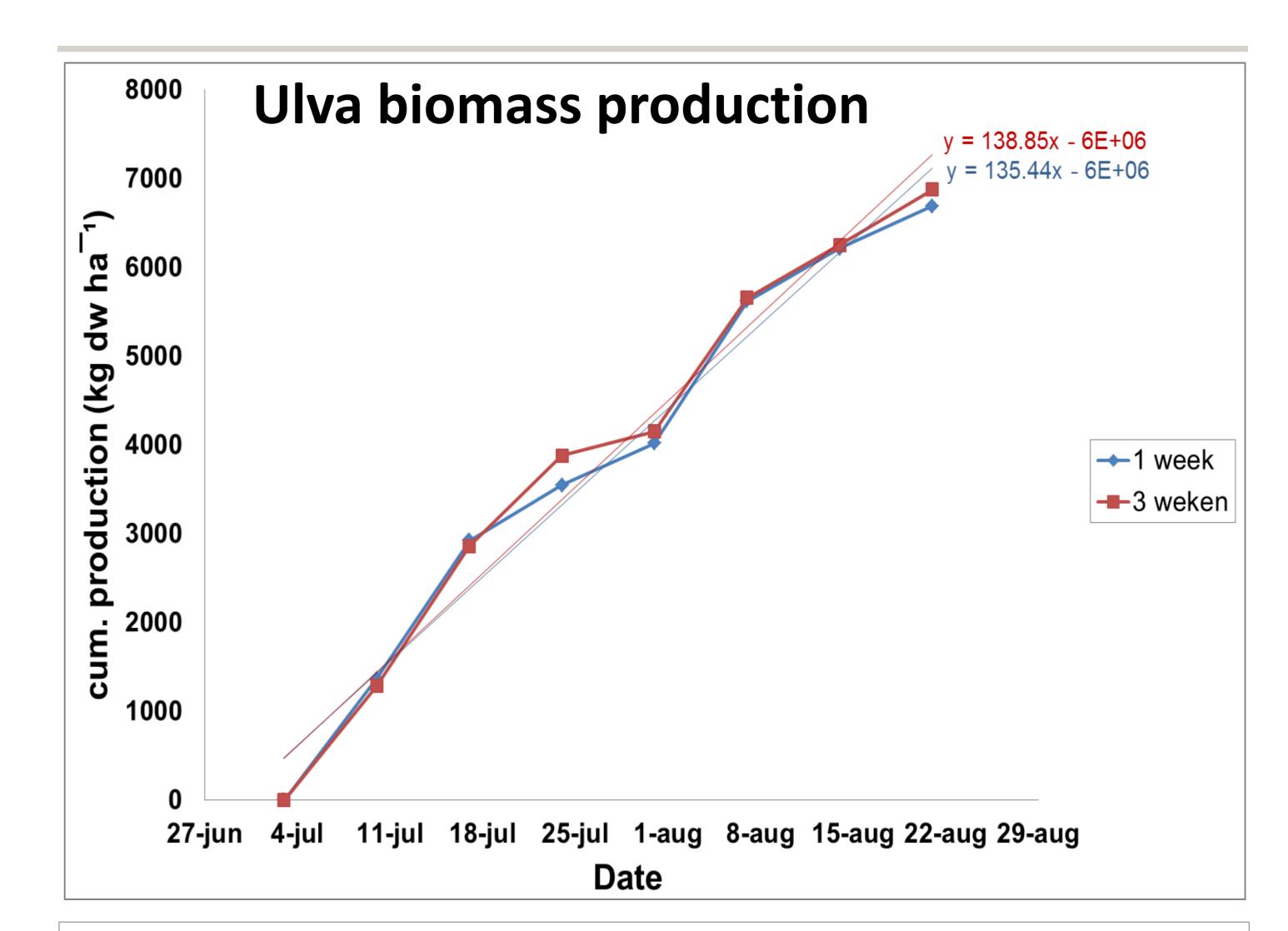
Objective

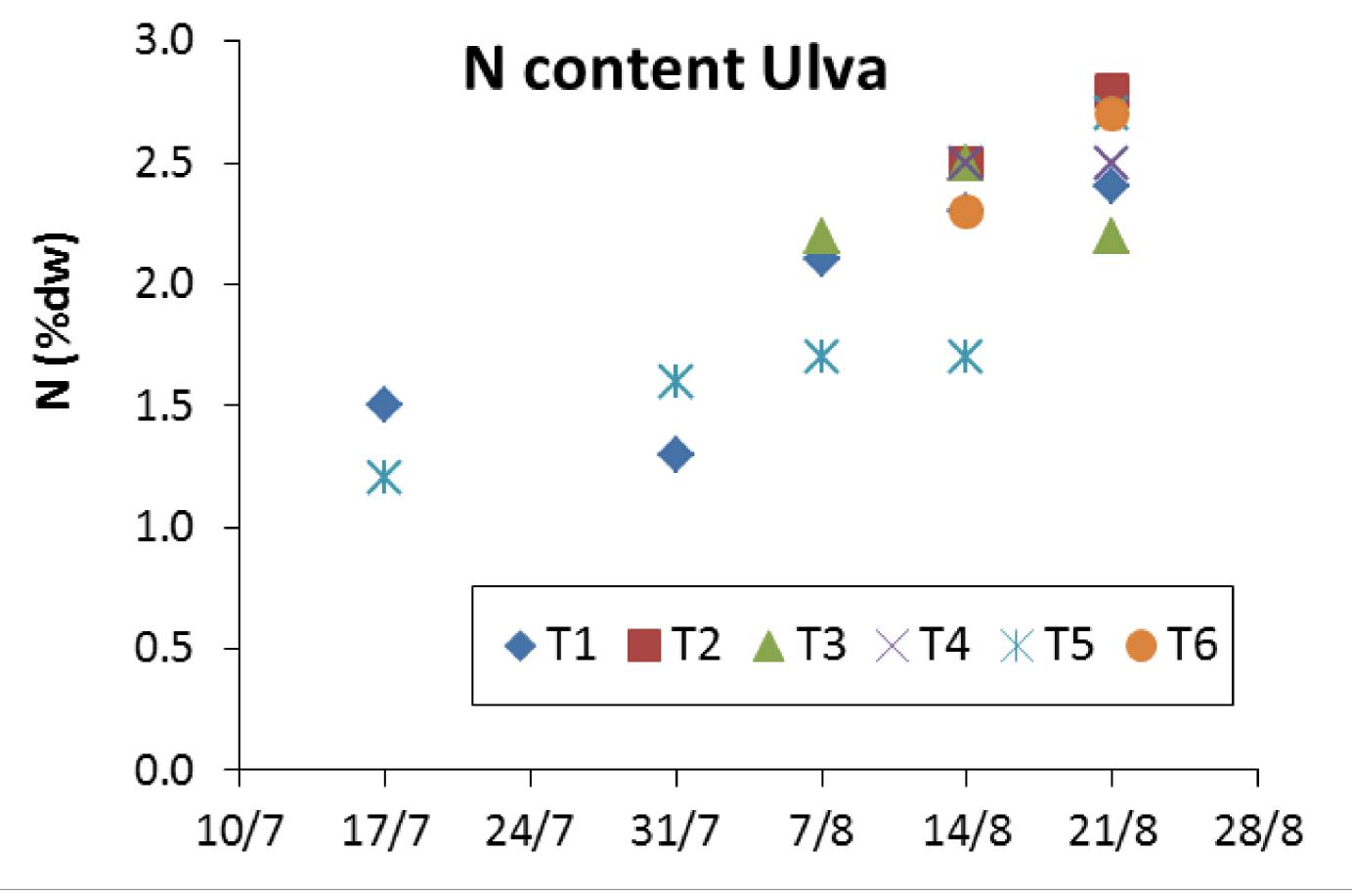
Study effects of harvesting frequency on production rates, nutrient uptake rates and chemical composition of the green seaweed *Ulva lactuca*

Method

- Ulva lactuca was cultivated in 6 tanks (T1-6) with running seawater without adding nutrients
- Harvested (with 250 g remaining) took place once a week (T1,T3,T5) or every 3 weeks T2,T4,T6)







Results

- No significant differences in production rate or nitrogen content between harvesting *Ulva* once every week or once every three weeks
- Nitrogen content increased during cultivation period
- Less frequent harvest means less trips with the harvesting vessel
- Growth rates and nutrient uptake rates were used in a model to predict production rates at different locations in the North Sea

Conclusions

When using a year-round seaweed production system, including the green seaweed *Ulva lactuca* and the brown seaweed *Saccharina latissima*, a total production of max. 35 t ds ha⁻¹ can be achieved

Acknowledgements

