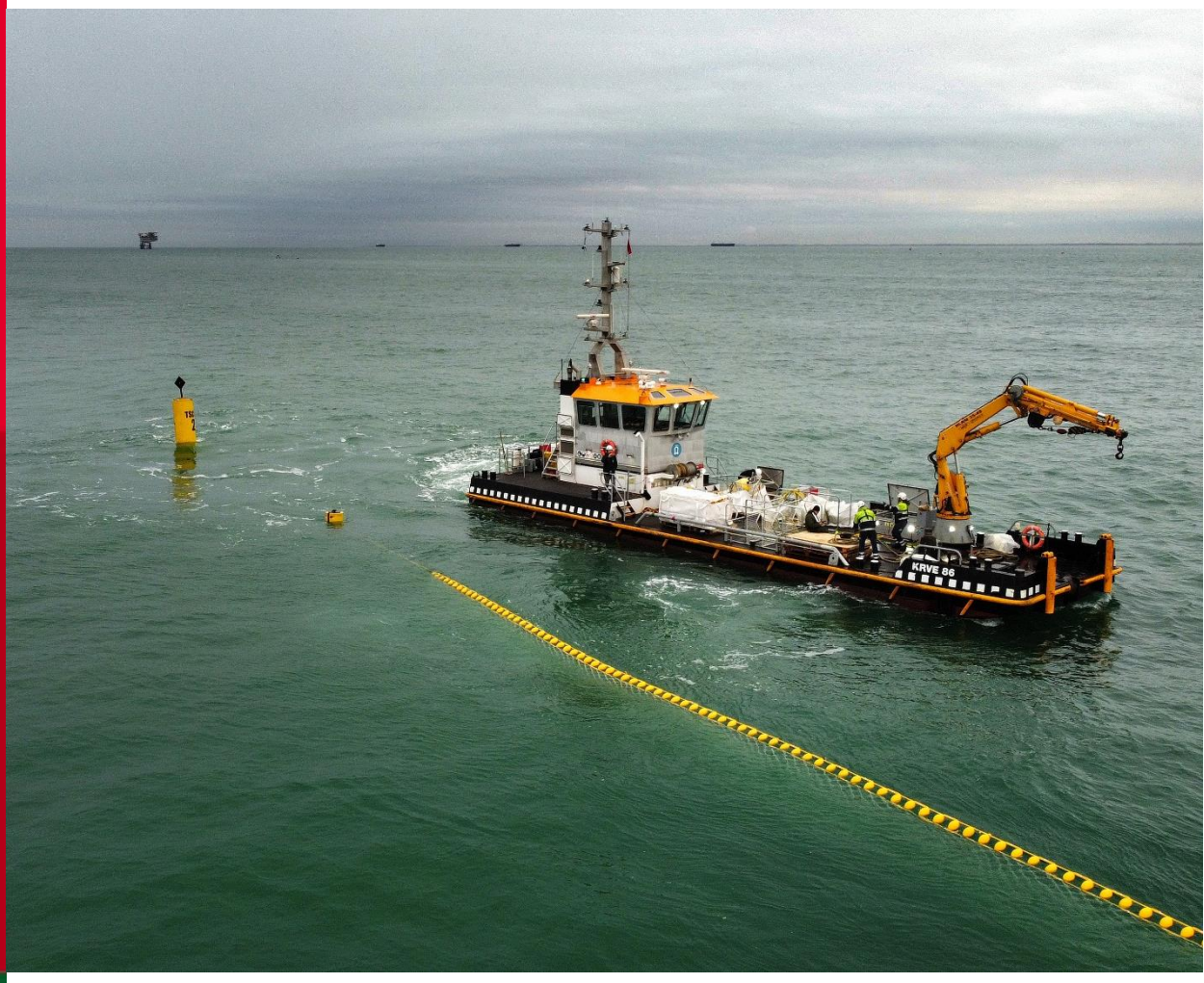
North Sea Farmers Annual Report 2020

June 2021



NORTH SEA FARMERS

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This is North Sea Farmers

North Sea Farmers supports entrepreneurs and companies to use seaweeds as sustainable, healthy food and resources, thereby realizing a positive climate impact. In 2020 our focus shifted from promoting and propagating seaweed to working on tangible collaborations. To realize these collaborations we worked internationally with a focus on Europe and the North Sea basin as starting points to showcase local value chains. A few weeks we worked from our office on the Zeestraat in The Hague, but most of the year the North Sea Farmers were supporting the seaweed community from home due to COVID-19. We kept creating network opportunities, sharing new insights and knowledge, develop new projects to validate seaweed potential. We want to serve and support our members. If they are happy, we are happy!

Manifesto

Things started 7 years ago with cultivating the first kilogram of seaweed from the North Sea by three idealists with hard hats. Not with the idea to become commercial farmers. But to unblock the discussion whether it was or wasn't possible to cultivate seaweed offshore. And it was! Since then our actions, collaborations and ambitions have outgrown our kitchen scale. In 2023, we aim to cultivate 1,000 tons of seaweed on the North Sea by connecting over 100 idealistic, but very realistic North Sea Farmers.

From 2030 onwards, our efforts will lead to 400 km2 of seaweed farms in between offshore wind parks. With the cultivated seaweed, instead of causing carbon emissions, we can reduce up to 1,6 million tons of carbon dioxide. That is massive! And we are saving fresh water while we are at it. On top of that, we are a driving force to improve marine biodiversity and realize a circular economy. All this makes this industry part of our planets future and provides thousands of jobs, at sea and on land.

So why we do it is pretty obvious: we believe in the healing power of seaweed. In its potential impact on nature, on humans, on economy. With it, we want to make this world a better, healthier place to live. A world in which biodiversity thrives, carbon emissions are reduced and our ecological balance is recovered.

How we do it? Together. Because it is so much more fun to pioneer with kindred spirits. And because we believe in the miraculous combination of very different people that transcend sectors and expertise, land and sea. North Sea Farmers take on many shapes, sizes and cultures: we work with governmental institutions, wind park operators, educational institutions, retailers, seaweed farms, fishermen, engineers, marine biologists and many more. This makes us a pretty inclusive bunch; not only towards nature (go biodiversity!), but also towards humans (go solidarity!). Why should we even differentiate the two? Everything is connected anyway.

So how about it? Are you committed to realize a positive climate impact with seaweed? Do you want to stay on top of regional and international developments, while being connected to the EU and UN? Then join our movement, become a North Sea Farmer and be part of the solution!

Summary of 2020

The year 2020 was a very dynamic year for North Sea Farmers due to external influences such as a global pandemic that made us work from home and changed the contacts with our community. Besides that, there were internal developments, such as a growing demand to make our work more concrete. This last development has challenged us to look at our positioning, the role we are playing now and in the future, and the products and services we provide for the seaweed sector.

Positioning: from one farm to a group of farmers

Our objective is NOT to realize one farm. Our objective is NOT to become a commercial seaweed farmer. Our objective is NOT to produce seaweed products. To create more clarity on what type of organization we are, Noordzeeboerderij became North Sea Farmers. Recognizable, international and a collective. Together with our community members OD design and BrandFriend, North Sea Farmers came to be. With a red-green logo, red for urgency and green for the solution, that should become a lot greener in the next coming years as the seaweed sector professionalizes and progresses.

Community

Because the seaweed sector in the Netherlands and Europe is in a start-up and scale-up phase our role as a sector organization is non-conventional. We approach the seaweed developments from a systemic point of view. This means that we bring together companies and stakeholders throughout the value chain. That is the basis of our seaweed movement. We function as an NGO (stichting) instead of an association. This makes it possible to be more agile and dare we say it, maybe even dream bigger. And because our North Sea Farmers movement challenges concepts of sector representation, it does not make our role easier. We are convinced that our organization will (co-)develop with the seaweed sector to make sure we support companies most effectively to realize a positive climate impact with seaweed.

With these changes and positioning we also took a stronger position in the European stakeholder landscape. With encouragement of the European Commission **we organized, together with Bert Groenendaal, a European stakeholder meeting with more than 200 participants**. Together with EABA, Seaweed for Europe and other EU fora we partook in a **quarterly EU coordination meeting with European Commission DG Mare**. These actions have led to a growing number of international community members joining North Sea Farmers. Due to the fact that the seaweed sector will play out on a level with lots of EU legislation and collaboration between specialists companies from different countries, we intend to make our community grow and make it more international.

For and with our community we have **organized multiple online events, working groups, knowledge sharing programs, newsletters and many one on one calls and meetings to support our members**. Next to that, we actively **represent seaweed sector interest in policy discussions** for example European Algae strategy, National Protein Strategy (NL) and National Water Program (NL). **Representation in the current standardization developments (NEN/CEN)** is also part of our work. Here we cooperated with Barentz, Cargill, and others do provide relevant input for better standards. This collaborative approach is very valuable to us and we strive to do this on more topics with more members.

With the growing activities and increased requests of the community we had to decide to increase the tariffs to better relate to the time and energy that is going into it. Our community activities are still partly funded by charity funds and other funds to make the ‘budget’ complete. With a growing community we foresee that in the near future (+/- 5 years) the community activities can stand on their own. Although we do not think it is a bad thing that societal partners invest in these activities.

To focus our activities further we have set up a business model together with Green Giraffe with input from Hortimare, The Seaweed Company and Green Marine Farming. This business model helps us as a sector to see critical elements that need to be solved or changed to take steps towards commercial seaweed farming and applications. In

the next chapter we will outline the status of different value chain segments and what kind of activities have been undertaken this year.

North Sea Farmers community 2020

>100 community members

across the supply chain

50% of our members operate worldwide, so our North Sea Farmers community is becoming increasingly international

We discussed thematic topics and connected members in **6 working groups**

In 2020 we organized **4 community events** for all members of the community

Online our community also connects with us! We have **1,240 subscribers** to the monthly newsletter and **2,850 followers** on

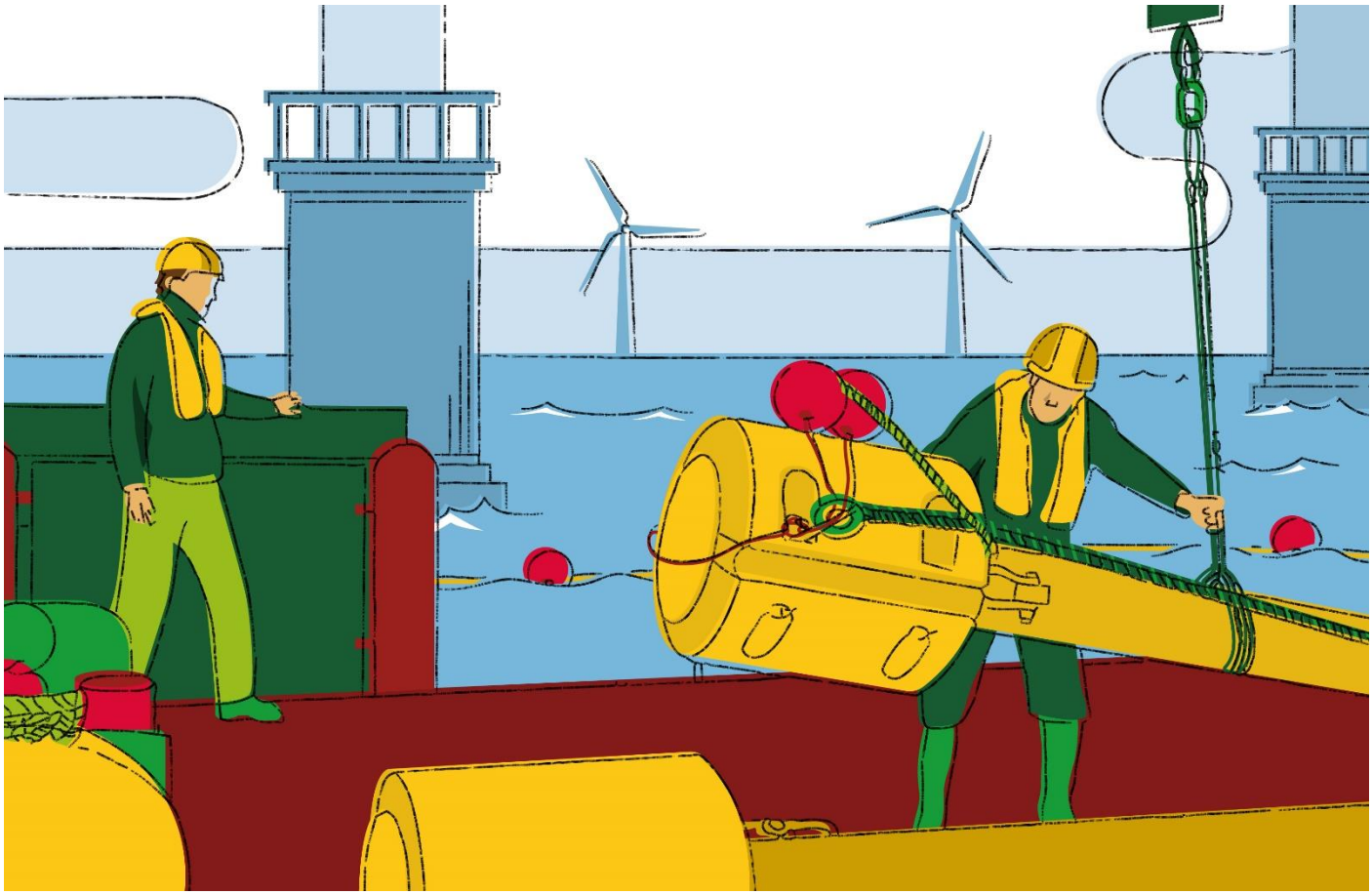
The seaweed value chain

For the business model the value chain has been divided into eight segments:
Location - Design and develop the area
Infrastructure and mooring - Installing infrastructures
Breeding and propagation - Making the best seedlings
Farming systems - Cultivating seaweeds
Harvesting - Time to harvest
Processing - Ashore for processing
Production process - Creating the products
End-user markets - Buying the product

Dividing the value chain into these segments also help us f.e. to inform stakeholders more clearly, to link certain phases to different members, and to address the steps we need to take in an orderly manner.

Design and develop the area

In order to realize a seaweed farm you must have a location. And this means permits. In Europe the commission is active to align marine spatial planning between member states. One of the objectives behind this is to make it easier to get a permit. In the Netherlands a permit can be applied for at Rijkswaterstaat. And policies have just changed to allow the multi-use of marine areas. E.g. seaweed farming within an offshore wind park. **Last year with support from RVO North Sea Farmers developed a multi-use procedure to facilitate North Sea Farmers to apply for a permit. Part of this activity was also the realization of a risk register.**
Project Multi-Use Procedure
Multi-Use Procedure Visual
Multi-Use Procedure Flowchart
MUP Boundary conditions register
MUP Risk register



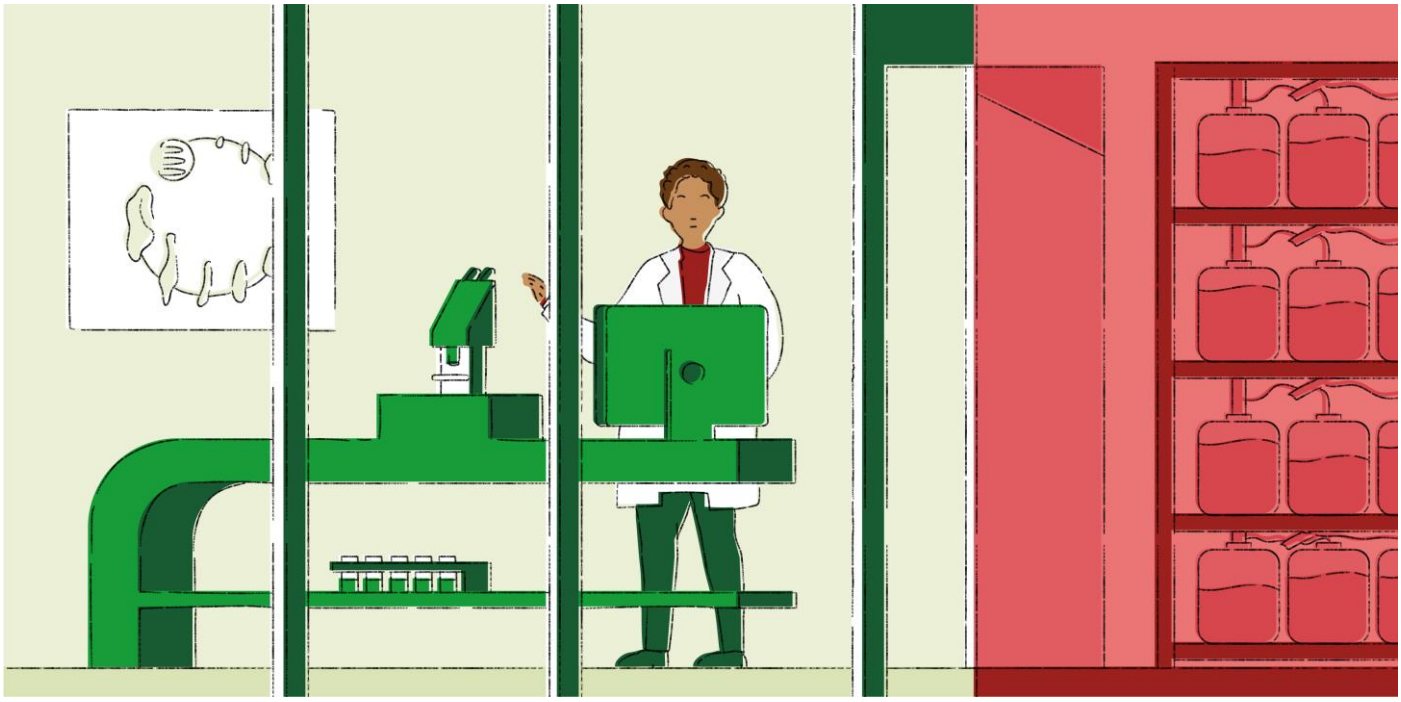
In the EU project Wier&Wind we develop this further into an investors roadmap and help seaweed farmers regarding regulatory aspects of permits and seaweed farming. **North Sea Farmers gave input to the new Water policies of the Netherlands**. The outcome is a 5 year exploration of seaweed farming at a size of 1 km^2. This period will be used to research and validate ecological impact, food safety aspects and economic viability. This first building block will give policy makers insights on the scale of seaweed farming in the Dutch North Sea. North Sea Farmers together with value partners such as The Seaweed Company is setting up an initiative to start such a large scale seaweed farm.

Press release Wier&Wind juli 2020

Installing infrastructures

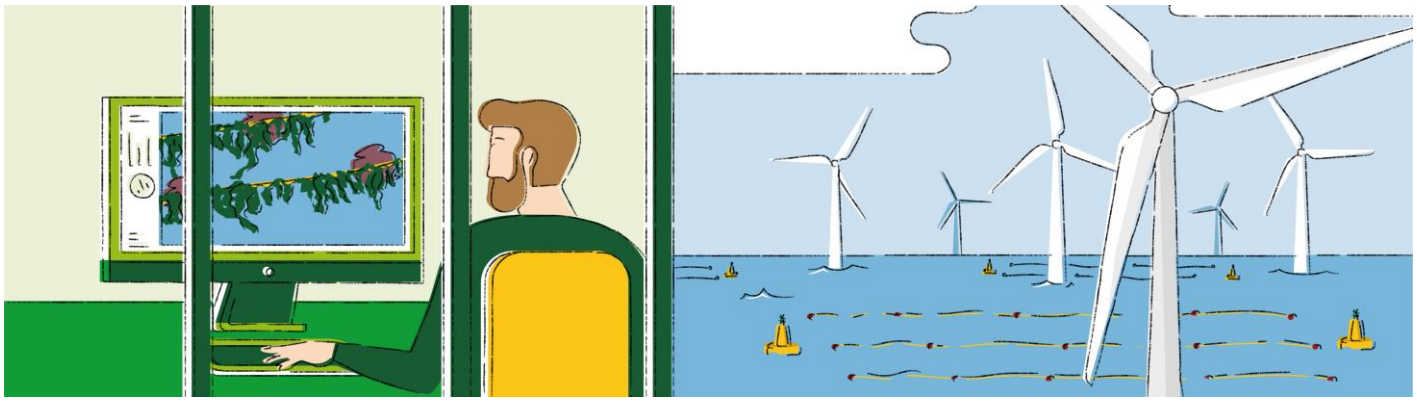
With large scale seaweed cultivation the mooring infrastructure is an important aspect of the business model. Is the seaweed mooring installed together with the foundations of wind turbines or are conventional sea anchors used? Together with the AFAS Foundation, North Sea Farmers is developing eco-anchor solutions. Our objective is to realize a mooring solution that is nature inclusive, that can be scaled up easily and can function for 25+ years. This way, if we scale of up seaweed farming, we do it in the best way possible. The challenging part of course is to make this financially viable. Therefor it is not only a technical project, it is also about involving stakeholders to get support and commitment. One outcome of this project is that **Orsted signed a letter of interest on our outline of nature inclusive mooring for seaweed farming as a form of multi-use in their wind park.** This year we made a design and a real life test is

planned for summer 2021. Our ambition is that this mooring will be used by a seaweed farmer.



Making the best seedlings

Currently most of the seaweed in Europe is wild harvested. This gives ample opportunity for making local seaweed products. But on the short term it is recommended when scaling up the seaweed industry to do so by means of cultivated seaweeds. This in order to minimize the impact of existing ecosystems. To be able to select species for cultivation it is important to look at those local ecosystems: what are the endemic seaweed species and does it match consumer preferences. **Together with the working groups food and cultivation a list of seaweed species is set up to give an overview of their potential to scale-up.** This list is also discussed with the related policy officer at the Ministry of Agriculture. Insights from these activities were that Wakame is not available for cultivation on the Dutch North Sea. And that there is a demand for red species such as Dulse although seedlings are not yet available. Currently sugar kelp is available for cultivation. Breeding company Hortimare has started a collaboration with the Dutch Seaweed Group related to seedlings. A collaboration that we support.



Cultivating seaweeds

In Europe most seaweeds are being cultivated in Norway and initiatives, both commercial as demonstrative, are popping up in Sweden, Denmark, Scotland, Ireland, Belgium and France. In the Netherlands in 2020 there were a handful of initiatives that were active or were planning seaweed farming activities. Zeewaar was active in the Eastern Scheld, together with Dutch Seaweed Group. In the Wadden Sea Nils Koster of Vlielander Zeewierkaas is farming sea lettuce. And The Seaweed Company started an offshore pilot (as part of the UNITED project) at the North Sea Farmers Offshore Test Site. Near the Haringvliet a project was also being set up as a nearshore large scale pilot being coordinated by Mark Soetman.

The mechanization of seaweed farming is being developed in multiple settings. Companies such as Murre have develop cultivation systems with seeding and harvesting techniques. They are also involved in the Wier&Wind INTERREG project. Also AtSeaNova delivers turn-key farms for nearshore and offshore use. Metal Productions develops seaweed farms. And in the early years of North Sea Farmers our own SMAC systems has been developed. Its not our objective to have our own technology so **we started collaboration from the port of The Hague (Scheveningen) with CIV Den Oever, Boeg Nautic and The Seaweed Company.** With North Sea Farmers as a coordinator a third iteration was developed and installed at the Offshore Test Site. The related harvesting system was visited (and approved) by Her Royal Highness Queen Maxima of the Netherlands. **The system has survived recent storms which was a positive but the new substrate for the seaweed seeds did not function as planned.**

In relation to monitoring of the seaweed farm multiple steps have been taken to develop dashboards and tools in the IMPAQT project. One of the main partners in this is Deltares. The objective is to realize remote monitoring solutions for seaweed farmers. Results are expected by next year. One of the aspects that are important when monitoring is nutrient flow and uptake. **To give real-time insights on parameters (light, nutrients, waves) North Sea Farmers has developed a data bouy for remote monitoring.** This is a collaboration with Proeftuin op de Noordzee. Steps were taken by North Sea Farmers, WUR and multiple EU projects to setup a parallel (and connected) monitoring program for growth and nutrient uptake but due to unforeseen events, planning of pilots was delayed and the programme was stopped.

Together with Sea Ranger Service and Bureau Waardenburg we performed a low CO_2 monitoring test with a remote underwater vehicle (Vriezoo). With the sailing ship of the Sea Ranger Service the ROV was used to take images of the seaweed farm to measure growth and check status of the system. The Sea Ranger Service is eager to develop support activities for seaweed farms and this was a great first step.

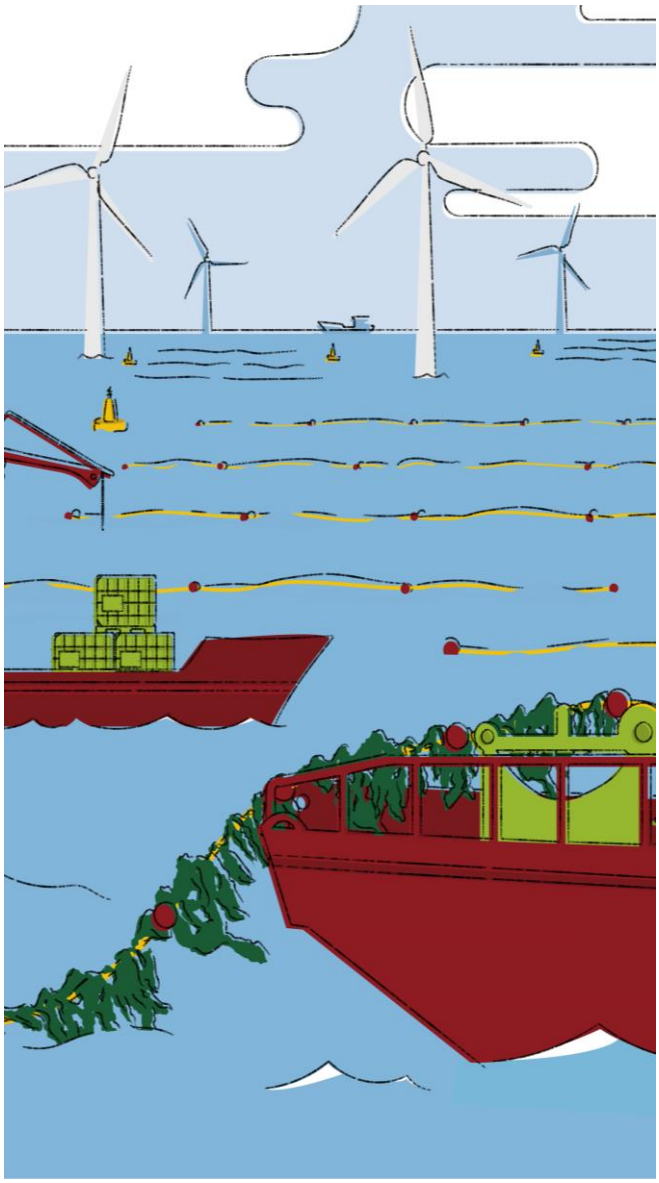
Time to harvest

As referred to in the last paragraphs multiple seaweed systems including mechanized harvest technologies are being developed and tested. Important insight in this is that the harvesting technology should have the possibility to be put on a (multi-functional) ship. Currently in the North Sea basin there are 1 or 2 seaweed harvests expected annually. This makes it challenging to have a dedicated ship for this. Here also lies a challenge (and opportunity) to collaborate with fisheries. As they are making choices on their future activities they will be investing in new ships. Maybe in the future fisheries can perform activities such as harvesting the seaweed.

With the seaweed being harvested we need to look at safety and quality of the product. **Together with Wageningen Food Safety Research sample measurements have been taken at Zeewaar, Dutch Seaweed Group, Offshore Test Site and Vlielander Zeewierkaas.** Point of attention especially of sugar kelp are the iodine and arsenic contents. Although these insights are not new, it will become more important to show and validate processing methods that lower iodine and arsenic contents of sugar kelp for further distribution in the value chain. **As part of this activity North Sea Farmers and WFSR have developed a sampling procedure for farmers to measure food safety, with a safety appendix for offshore sampling.** Both are available via North Sea Farmers. And we have worked on a database of test results that is nearly finished.

Food safety overview Wageningen UR

As part of the ValgOrize project **talks are underway with Global GAP and Skal among others to get certified seaweeds from the North Sea.** A next step would be to set up a pilot with value chain partners to test certification. This includes the propagation methods when it comes to organic certification. As part of the ProSeaweed project Zeewaar also has develop a procedure for ISO standards together with Control Union. Insights on this will be published end of next year.



Ashore for processing

In most instances when the seaweed comes from the water it undergoes a processing step to prepare it to be made into an end-product. Processing methods can be washing, drying, silage and other biotechnological processing steps. For the latter aspect multiple projects have researched this. For example MarcoFuels with TNO and MacroCascade. The projects ended this year and final products are available on their websites. In the Bio4safe project **North Sea Farmers together with Ocean RainForest, Van der Zwan, Damen, Danvos, Rhinetec and Algaia demonstrated the processing of sugarkelp into a biostimulant**. The test included logistics, processing steps and usage on multiple crops. The results show that sugar kelp does not under perform with Ascophyllum which is a fantastic insight. This test also plays an important role in the business model to process large amounts of sugar kelp.

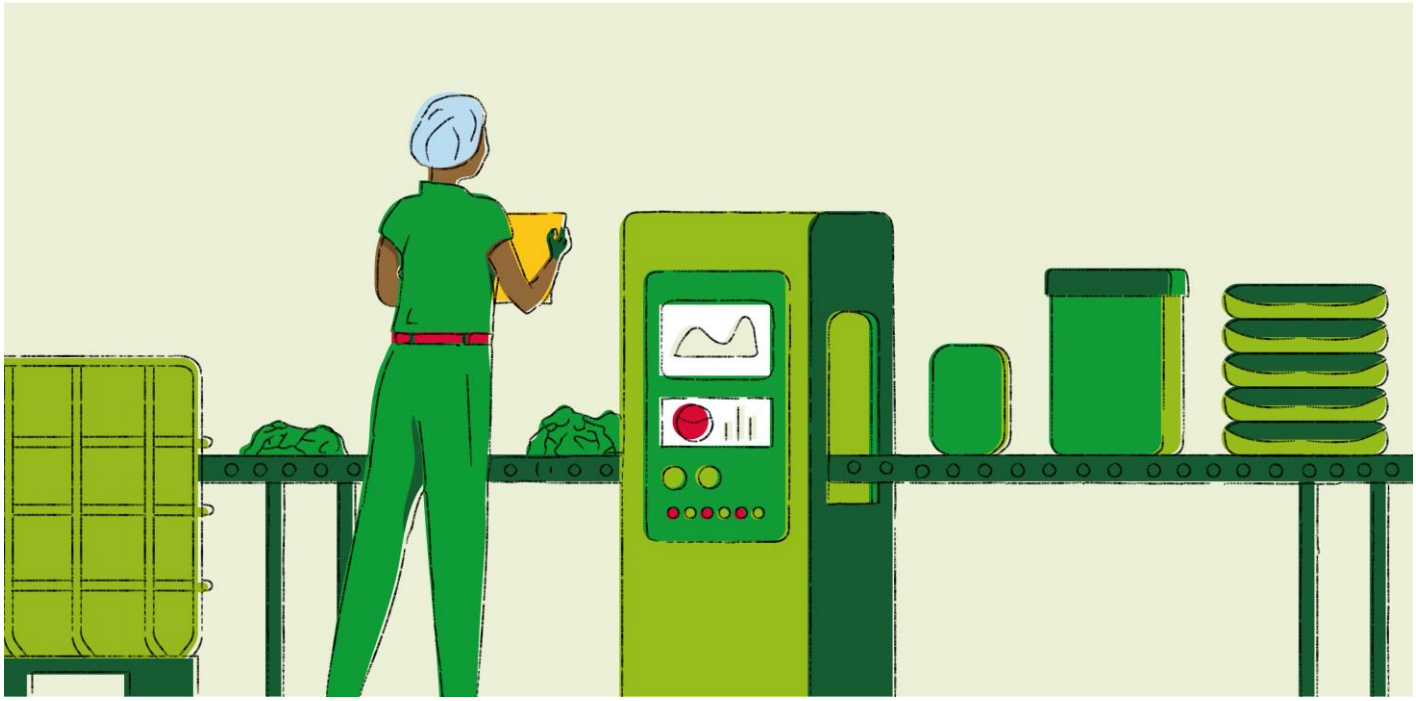
Creating the products

Many new seaweed products came to market. Companies such as Seamore, WIERDO, Sea Greens and The Seaweed Company made new tortilla chips, wraps, snacks, burgers and drinks. Also multinationals Unilever, Nestle and Orkla are looking into seaweed. With Unilever putting seaweeds in their future fifty foods, Nestle partnering with the Safe Seaweed Coalition and Orkla making investments in Scandinavian seaweed farms.

Together with Dutch Cuisine, **North Sea Farmers organized a cooking workhop with chefs and seaweed entrepreneurs at the Haagse Horeca Academy**. Sharing insights, experimenting with seaweed and eating a meal together. This year we will continue the partnership with Dutch Cuisine. These activities help to develop new consumer products.

One important food application is to use it as alternative protein source. Both in European and Dutch policies seaweed as a protein source is suggested to be the future. Currently in the ProSeaweed research programme both desk study and practical tests are being performed to get more insights in the potential. Multiple companies, for example Goa Ventures are keen on making this a success and already work with proven technologies.

For animal and plant products we see that research is being done to better understand working mechanisms of seaweed products. In feed, many companies such as Barentz, Lambers-Seghers and NorthSeaweed have developed feed additives to stimulate gut health, use less antibiotics and increase milk volumes. Much of the seaweed is imported from the global seaweed market. Currently research is done by WUR to look at the potential of local sugar kelp as feed additive to increase milk yield. Methane reduction by means of seaweed is also heavily been put into the spotlight. As North Sea Farmers we are critical on this application due to the main working ingredient being bromoform in the seaweed Asparagopsis.



For plants, mainly the use of biostimulants, North Sea Farmers has been looking for a local alternative for Ascophyllum. Steps with sugar kelp have been taken and show potential. **With using these products farmers can lower their fertilizer and water usage.**

The materials and energy applications of seaweed are present but North Sea Farmers hasn't looked into this very much. Cosmetics and pharmaceuticals do have our attention with members The Tides and a growing number of cosmetic companies that are working with seaweeds. The cardiovascular department of Erasmus MC is researching seaweeds and their effect on Alzheimer's disease, first trials in mice studies have shown very interesting outcomes.

Buying the product

To get more grip on the seaweed market we have commissioned multiple market studies. The first market we have looked into was the European food market. More than 40 food organizations have participated in this research. Earlier we have performed market research in the biostimulant market. In the future it would be interesting to quantify the feed market.

EU Food market study (ValgOrize)
Biostimulant market research (Bio4safe)

We also performed a consumer study which concluded that consumers want local and sustainably produced seaweeds. For food entrepreneurs the research can give insights for product development.

Dutch consumer studies

Together with the food entrepreneurs North Sea Farmers made a portfolio of seaweed products containing more than 40 commercial available seaweed products in the Netherlands and abroad. Hopefully many more will follow in the next years.

Organization

The organizational structure has been changed end of 2020. From a single executive board with Marcel Schuttelaar, Job Schipper and Ton Menken we shifted to a two tier structure. This means that there is an executive board with Koen van Swam, Eef Brouwers and Marlies Draisma and a supervisory board with Marcel Schuttelaar, Ton Menken and Job Schipper. Also an advisory board is installed with Anouk Florentinus, Martijn van Dam and Sybilla Dekker. In January 2021 Sybilla Dekker left the advisory board due to her role in the North Sea Agreement and Job Schipper moved from the supervisory board to the advisory board. This means we have one vacancy for the supervisory board.

The executive team also had some developments. With some bigger projects coming to a halt, we decided to say goodbye to two of our colleagues. This happened in a pleasant and constructive manner. In this way we secured the continuity of the organization. Due to COVID-19, project developments have been more challenging than recent years. The organization went from 7,7 FTE to 5,7 FTE. We also enjoyed working together with multiple consultants such as BrandFriend, Aqitech and Schuttelaar & Partners to support us with different activities.

Financial overview 2020

Income

North Sea Farmers' income largely comes from government grants (research projects). To a lesser extent, these come from companies affiliated with the community and commercial assignments. There have also been charity donations to help North Sea Farmers with sector development in general or on a more project-based basis.
All income is aimed at connecting and driving sector development. In 2020, total revenues were 1,001,604 euros against a budget of 860,523 euros. The income shows a growth of 20% compared to 2019. This growth can be explained by the attraction of new European projects, new donors such as the AFAS foundation and, to a more modest extent, a growing number of community members.

Expenses

The total expenses in 2020 add up to 903,085 euros, which is slightly lower than budgeted. Expenses have gone up by 13% compared to 2019. The sum of the expenses is made up of costs for administration and management, financial costs and costs spent on the objective of the foundation. Our objective is always our reference when it comes to spending for strategy and implementation.

Administration fees

Costs of administration with 10.457 euro are to be classified as low.

Fees MT (executive board) & supervisory board

Last year, the members of the Supervisory Board made use of an attendance allowance of 9,000 euros. Marlies Draisma and Koen van Swam are employed by North Sea Farmers and have received salary for their activities. Eef Brouwers is employed as an expert and consultant for North Sea Farmers via WierBrouwers. He advises on various European projects and is invested in the project-based development of cultivation and technique. His activities and projects are evaluated every six months and extended where necessary.

Continuity fund

After the financial results of 2020 there is 209.892 euro in the continuity fund. This fund is used to mitigate financial risks in the offshore and research projects. The aim is to have a reserve available to cover salary and fixed costs for 3-6 months. Currently the reserve can cover 3 months.

Investment policy

North Sea Farmers has made no investments in 2020.

Volunteers policy

North Sea Farmers has not made use of volunteers in 2020.

Looking ahead

North Sea Farmers will continue to break through the chicken and egg discussion between cultivated seaweed supply and demand. The business model gives us and our community insights on which steps to take. The seaweed sector needs large (>1km2) initiatives and we want to bring companies together and lead and support them towards this opportunity. By making seaweed farming more concrete, new challenges will surely arise and it will not be easy to realize such a project. But in order to scale up the seaweed sector and its ambitions we feel the need to be pushing this development forward. So we are looking forward to help you find your way in the seaweed sector, set-up value chains and validate and showcase the seaweed potential!