

# A Norfolk-Based Seaweed Nursery

Published on 25/01/2024. Written by **Rikke Nagell-Kleven**, Innovation Consultant at Hethel Innovation and Seaweed in East Anglia (SEA) Project Manager.

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## What Is a Seaweed Nursery?

As discussed in the 'Best Practice Report and Current State Analysis of the Norfolk and UK Seaweed Sector in 2023', establishing a local seaweed nursery could significantly boost local production and awareness of seaweed opportunities. This should therefore be a key focus point alongside supporting seaweed cultivators that want to farm in the area to accelerate a seaweed industry in Norfolk. A seaweed nursery or hatchery is usually a bio-secure system used to store propagules (equivalent to higher plant seed stock) of specific strains of seaweed local to the sea farm and use them as required to produce seaweed-seeded lines (SAMS, n.d.). Any hatchery needs to be designed to enable production of a variety of species based on environmental sustainability, best practice technology and market demand (McElligott et al., 2022). In Norfolk, the only species currently farmed is *Saccharina latissima* (Sugar Kelp), so this would most likely be the initial focus of a potential local hatchery.

Seeded lines of seaweed are typically grown on string or twine in a tank-based culture system. Even the type of twine to be used needs careful consideration (Kerrison et al., 2020). Every seaweed nursery or culture system requires a few main ingredients for successful culture, where the three most important components of a culture system are seawater medium (seawater with added nutrients), temperature and light (Edwards and Watson, 2011; Redmond et al., 2014; McElligott et al., 2022). A system that allows for a ready supply of fresh filtered seawater is optimal and an airline, and a light source and constant temperature equipment are also needed. The development of the gametophytes and growth of the young sporophytes need to be monitored. After around two to three weeks, the sporophytes can be seen on the cultivation string and, depending on the production conditions, are ready to be planted out around week four once the plants have reached about 1-2 mm in length (Edwards and Watson, 2011; Redmond et al., 2014). The seeded lines of seaweed will then be transported, deployed at the licensed cultivation site, and left for approximately six

months to grow before harvest. For more information about seaweed nurseries, see the 'Technical brief on species and methods for farming appropriate to the Norfolk coastal environment' SEA project deliverable developed by Cefas.

## Why the Need

A local seaweed nursery is optimal because it can be challenging to transport or import or seaweed seedlings from places far away from where the seaweed will be cultivated. This is because transportation of the seeded seaweed lines could lead to them arriving in an unhealthy condition. Most UK seaweed cultivators are currently sourcing their seeded lines from the Scottish Association for Marine Science (SAMS) in Oban, Scotland or from Hortimare in the Netherlands. Only a handful of seaweed cultivation sites are located close to these companies' operation sites. The cost of seedlings is another barrier for some cultivation companies as the current cost lies around £2 per meter, and there might be scope for a lower price point.

Having a local seaweed hatchery becomes more critical when it comes to scaling up the industry. Biome Algae, located in the South West of England, is given as an example of the importance of this in the 'Best Practice Report and Current State Analysis of the Norfolk and UK Seaweed Sector in 2023'. Biome Algae has a production capacity of 60 wet tonnes of biomass, with plans to scale up to produce 10-20,000 tonnes of wet seaweed by 2030. The seaweed species in focus is locally sourced sugar kelp and Hortimare currently produce their seeded lines. This year, Biome Algae will place 44,000 meters of seed in the water, but as they scale, the quantities of seedlings needed could be challenging to import. Accordingly, Biome Algae has the ambition to collaborate with other farmers to establish a hatchery in the South West with expert support from Hortimare. This would allow local cultivators a fast and easy access to stocks.

In Norfolk, a local seaweed nursery could potentially have a transformative impact on the seaweed industry as it scales up. A regional nursery could attract more seaweed cultivators to apply for a licence to farm seaweed in the area and lower the barriers to establishing new seaweed-related businesses in Norfolk. A nursery facility would also represent opportunities for local job creation.

## Possible Local Locations

When developing a regional seaweed industry with local supply chains, it is important to consider the facilities already available, as well as potential locations to host the activities needed. Norfolk Seaweed is the only company

in Norfolk with a current licence to farm seaweed and they have expressed interest in establishing a seaweed nursery in the future and collaborating with others on this. It will therefore be essential to collaborate with Norfolk Seaweed when creating development plans for a hatchery. Norfolk Seaweed is also working with Holkham Estate on future operation and processing facilities, including possible co-location of a seaweed nursery. A seaweed hatchery at Holkham Estate could supply Norfolk Seaweed and potential future cultivators in the region with spores from local seaweed species.

Another possible location for a seaweed nursery in Norfolk is Norwich Research Park about one hour by car to North Norfolk. The park has vast expertise in various fields, equipment and spaces that could be used for seaweed hatchery activities. Cefas also has laboratories in Lowestoft, which could be another hatchery placement option. This site is located about 1.5 hours from Norfolk Seaweed's operations.

### Who Can We Learn From?

Many studies have been conducted and reports written on best hatchery practices, and several organisations are developing and operating seaweed nurseries. SAMS seaweed nursery is the UK's first dedicated commercial macroalgae husbandry facility. Using knowledge derived from two decades of applied seaweed cultivation research, SAMS Enterprise stores seedstock and provides seeding material and expertise to seaweed farmers and producers (SAMS, n.d.).

Hortimare in the Netherlands provides hatchery advice, support, and starting material to seaweed farmers. The company currently focuses on *Saccharina latissima* (sugar kelp) and *Alaria esculenta* (winged kelp) and collaborates closely with seaweed farmers as they scale up to the larger volumes needed to make seaweed a competitive alternative to land-based products (Hortimare, n.d.). Hortimare also researches on breeding methods with a view towards breeding specific species and crosses of seaweed, yield improvements, temperature, disease resistance and for particular compounds that are wanted by specific industries. Hortimare is one of the leading seedling suppliers to the seaweed industry in the South of England, such as to the Cornish Seaweed Company cultivating sugar kelp in Cornwall.

Another organisation to mention is Green Wave, which provides modular hatcheries advice. GreenWave is a North American nonprofit focused on the development of regenerative farming techniques for aquaculture. They operate one of the largest sugar kelp hatcheries in the United States, growing the majority of kelp seed for farmers in Southern New England (GreenWave, n.d.). In addition, they broadcast live training for hatchery

technicians and conduct cutting-edge research on induced sporulation and kelp climate resilience (GreenWave, n.d.).

A company closer to home that is developing seaweed hatchery technology and capabilities is Ireland's Pure Ocean Algae, which has finished building a 600 m<sup>2</sup> seaweed hatchery building on the Beara peninsula, hoping to address the industry's biomass bottleneck and set it on the path to success (Howell, 2023). Various highly informative technical reports on seaweed hatchery development have been published (e.g. Edwards and Watson, 2011; McElligott et al., 2022) by the Government of Ireland and commissioned by the Seafood Technical Services Bord Lascaigh Mhara (BIM). These studies are part of the Irish Seaweed Development Programme.

### What Do We Need to Make This Happen in Norfolk?

To establish a seaweed nursery in Norfolk, we should take advantage of available local R&D expertise and facilities and collaborate with local universities, such as the UEA. To scale up a seaweed industry in Norfolk, a seaweed hatchery is essential, as sourcing seeded material from distant locations is expensive and may not remain viable as the industry develops and expands. For this, in addition to local support, domestic and international expertise will be needed alongside funding for materials and operations and a suitable location near present and future cultivation sites. Where possible, equipment for a seaweed nursery might be sourced from places such as the UEA or Norwich Research Park, which might have valuable resources (e.g. incubators and tanks) that are no longer in use.

### Recommended Next Steps to Develop a Norfolk-Based Seaweed Nursery

- Work with other organisations that have experience with building nursery and hatchery capabilities, such as SAMS in Scotland and Hortimare in the Netherlands, to identify what is needed to make a local nursery in Norfolk a reality.
- Decide on the best location of a nursery in Norfolk.
- Identify associated costs and resources needed to build hatchery facilities in Norfolk and investigate funding opportunities.

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