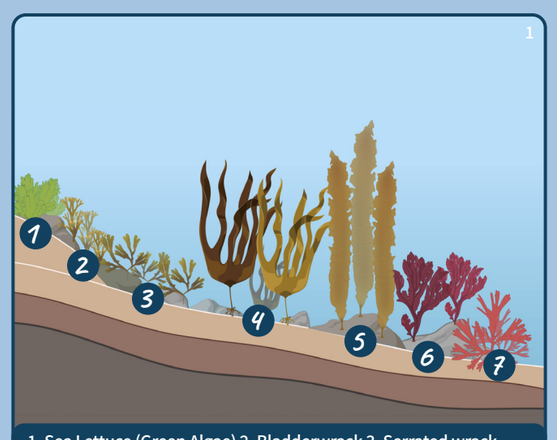
DISCOVER ALGAE

Good for People and Planet

What are Algae?

There are an estimated 500,000 different species of algae worldwide. Most of these plantlike organisms are microscopic (»**MICROALGAE**«) and live in freshwater. Around 10,000 species can grow several metres long (»**MACROALGAE**«) and are primarily found in the salty oceans, where they are known as »kelp«. In the Baltic Sea, there are approximately 200 species of macroalgae, with around 350 in the North Sea . Along our local coastlines, the three different families of algae (brown, red and green) are clearly visible and can be distinguished by their colour: **GREEN ALGAE** require the most light and nutrients for growth through photosynthesis and thrive in shallow waters. **BROWN ALGAE** are found in deeper zones, while **RED ALGAE** can be found at depths of up to 20 meters, depending on the location.



1. Sea Lettuce (Green Algae) 2. Bladderwrack 3. Serrated wrack
4. Horsetail Kelp 5. Sugar Kelp (Brown Algae) 6. Dulse
7. Sea Beech (Red Algae)

What Can Algae Do?

Algae provide us with a variety of beneficial »**ECOSYSTEM SERVICES**«:

1. **KEYSTONE SPECIES:**
Algae are the foundation of the food chain in marine environments. They produce essential oxygen through photosynthesis (like land plants). Every second breath we take comes from the ocean!

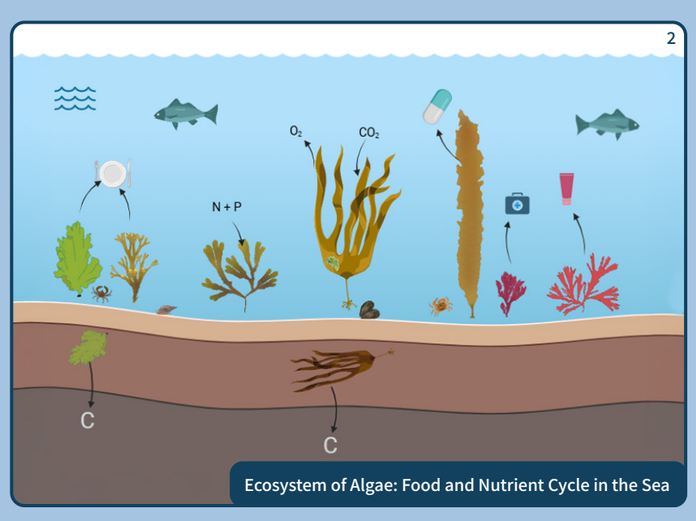
2. **ALL ROUNDERS:**
Many algae are edible and delicious; they also purify our water. They can be used in packaging, textiles, as natural fertilizers, feed additives, construction materials and fuels. Algal compounds are being intensively researched as promising candidates for future medical applications.

3. **NATURAL REGULATORS:**
Algae absorb excess CO_2 and nutrients, regulating chemical processes and thermal balance in the ocean. Algal forests mitigate wave energy (like seagrass meadows) and protect inhabited coastlines from flooding. They also promote and preserve biodiversity in the sea.

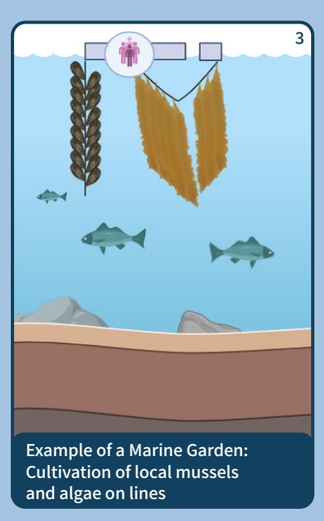
4. **»GOOD FOR THE SOUL«:**
Algae are not only useful but also beautiful to look at in their variety of sizes, shapes, and colours. On a typical walk along the beach, we inhale not only mineral salts from the sea breeze, but also many other healthpromoting compounds from algae (e.g. polyphenols, known for their antioxidant properties). For a closer look, snorkeling, diving tours or »coastal safaris« reveal speciesrich underwater meadows and forests.

Algae provide important habitat

- Algae create their own ecosystems and high-quality biotopes in all oceans and along our coasts, such as kelp forests and seaweed meadows.
- In Germany, reefs and other substrate (i.e. stones covered with macroalgae) are legally protected under European law. (Flora-Fauna-Habitat Directive, LRT 1170)
- Algae are biodiversity hotspots: They provide habitat for other algal species and many other marine organisms, serving as nurseries for crustaceans and fish, as well as a food source for fish and snails.



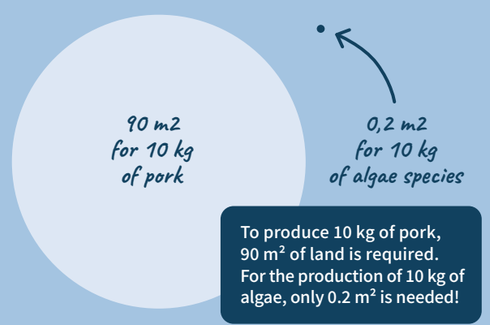
Ecosystem of Algae: Food and Nutrient Cycle in the Sea



Example of a Marine Garden: Cultivation of local mussels and algae on lines

How Can We Use Algae Sustainably?

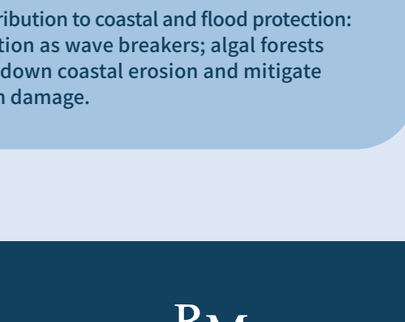
SEA FARMS AND SEA GARDENS: A RESOURCE-EFFICIENT WAY TO GROW FOOD AND MATERIALS:
- No land area or freshwater consumption
- No use of fertilisers or pesticides

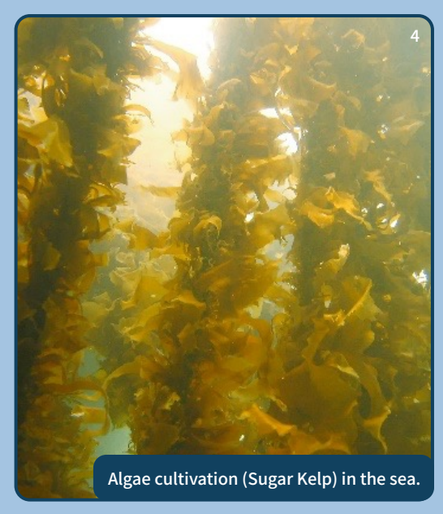


To produce 10 kg of pork, 90 m² of land is required. For the production of 10 kg of algae, only 0.2 m² is needed!

SUSTAINABLE WILD HARVESTING IN COASTAL AREAS:
Around 1 million tons of algae are harvested from wild stocks worldwide each year, nearly a third of which is in Europe (280,000 t).

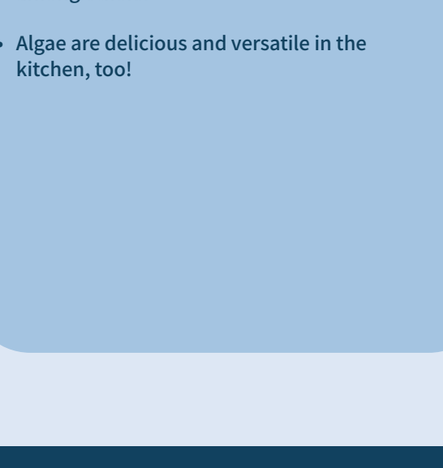
CULTIVATION AND HARVESTING IN ALGAE FARMS:
Globally, over 36 million tons of algae are produced annually from commercial aquaculture, with the majority (>99%) in Asia and only 0.1% in Europe (30,000 t). (FAO, 2022)





Algae cultivation (Sugar Kelp) in the sea.

REGIONAL SEA GARDENS:
Regenerative and community-based cultivation of seaweed and mussels has been established in Denmark for 10 years. The Danish association Havhøst was founded in 2015 and coordinates approximately 30 sea gardens, also serving as educational sites for schools. This raises awareness among students about marine protection and the production of food from the sea. In the Flensburg Fjord, a German-Danish marine garden was established in 2024, focusing on regional community-based cultivation and harvesting of mussels and sugar kelp (**www.flensburger-meeresgarten.de**).



Algae cultivation in the Flensburg Sea Garden.

Algae are Good for the Climate!

- O_2 (Oxygen) production, CO_2 (Carbon Dioxide) absorption: Approximately 5 million tons per year, similar to the Amazon rainforest.
- pH regulation counteracts ocean acidification, thus preserving calcifying organisms which need alkaline water to form their shells (molluscs, snails, corals, foraminifera).
- Nutrient absorption, especially nitrogen (N) and phosphorus (P), helps combat eutrophication of the oceans and mitigates algal blooms.
- CO_2 sink and CO_2 storage: Incorporation of carbon (C) into algal biomass through photosynthesis; algal detritus sinks to the ocean floor, where carbon is stored.
- Contribution to coastal and flood protection: Function as wave breakers; algal forests slow down coastal erosion and mitigate storm damage.

Algae are Good for you!

- For internal and external use, e.g. as food, dietary supplements, in skincare or medical research.
- Algae contain valuable compounds: These have antiviral, antitumor, antibacterial, antioxidant (protection from free radicals), antiinflammatory, and moisturising (skin) properties, while regulating gut flora, among others.
- Algae are delicious and versatile in the kitchen, too!

Interreg Deutschland – Danmark
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