SUSTAINABLE SEAWEED

Farming at sea

Seaweed grows rapidly, is extremely nutritious and can be cultivated sustainably at sea. Since this summer, a floating laboratory has been bobbing about in the Eastern Scheldt in an attempt to learn the first principles of sea farming. **TEXT AND PHOTO** HANS WOLKERS

'This seaweed has grown almost a metre in four weeks.' Seaweed researcher Julia Wald holds up a large piece of brownish sugar kelp, a seaweed growing on ropes suspended from a floating frame in the Eastern Scheldt. Four of these seaweed rafts tied together form the modest field station where Wageningen researchers are studying seaweed cultivation. It's not much fun working here today; there's a force-five wind blowing, which has transformed the Eastern Scheldt into a rough sea with white-tipped waves and the field station is being tossed about. The next rope that Wald hauls up is almost empty. 'Two weeks ago there were still big pieces of sea lettuce, about thirty centimetres', she says. 'Maybe the current has torn them off.' The researchers are not disappointed though. 'This way we learn a bit more each time', says the project leader Willem Brandenburg with a laconic smile. The driving force behind the project, Brandenburg is a man with a mission. He regards seaweed cultivation as *the* solution to the world's food problem. In forty years' time the global population will be nine billion. To feed all those mouths we need to double food production. In the seaweed researcher's view, conventional agriculture just isn't an option. It is unsustainable because of excessive use of fertilizer and because nature is being destroyed to make way for agriculture. Brandenburg sees far more potential in sea farming. 'There's plenty of space at sea', he states. 'On top of that, seaweeds grow very fast and contain as much as 25 per cent high-quality protein.' This can be processed in food, but also in animal feed. He has calculated that we would need much less space to provide the entire world population with protein from sea farming than from conventional farming on land.

PURIFYING EFFECT

At present, over 90 per cent of all seaweed cultivation takes place in Asia, but it is taking its toll on the environment. Inefficient application of large quantities

Researcher Julia Wald and project leader Willem Brandenburg on the floating algae farm on the Eastern Scheldt.

of fertilizer results in high yields, but the surrounding coastal ecosystems are being destroyed. Brandenburg and his team, from Plant Research International, part of Wageningen UR, are focusing on environment-friendly seaweed cultivation for which they intend to make use of nutrients that have already made it to the sea as a result of human action. More than thirty million tons of phosphates are discharged from rivers into the world's seas each year. A sea farm near the mouth of one of these rivers doesn't need extra fertilizer. Seaweeds absorb these nutrients and thus purify seawater.
Because of this purification effect Brandenburg sees potential in using seaweeds as bio-filters in fish farms. Sea lettuce, for example, is ideally suited for integrated culture of fish, or crustaceans, and shellfish. This seaweed absorbs the nutrients that are released from the fish excrement. It can work the other way too: you could protect corals from excess nutrients by building a ring of seaweed cultivation systems around vulnerable reefs.

> 'There's plenty of space at sea'

The opportunities for seaweed cultivation in the Netherlands are excellent, according to Brandenburg. A number of indigenous edible species grow well in the conditions here. By making clever use of the fact that different seaweeds grow at different depths, a sea farmer can increase production by growing crops in layers. 'Sea lettuce is a green seaweed that absorbs mainly red light. You need to grow this kind in shallow water, as red light does not penetrate very deep', explains Brandenburg. 'Brown and red seaweeds, such as oarweed and sugar kelp, absorb green and blue light from the spectrum, and as these two colours penetrate to greater depths it's possible to grow these seaweeds further down.

LEARNING TO HARVEST

Before the first commercial sea farmers can start, a lot more water will have to flow through the Eastern Scheldt. Learning to grow seaweed is the first step; efficient harvesting and partial processing at sea are the next hurdles. Brandenburg and Wald think that large-scale cultivation will have to be done mainly on the open sea, as space is limited in coastal areas. Making use of oil drilling platforms and wind parks at sea would be an ideal way to farm seaweed. But the problem there is that you don't have the nutrients that wash into the sea from rivers. 'You could deliberately introduce seaweed cultivation in estuaries where you want to improve water quality', says Wald.
Both researchers are also focusing on the economic aspects of seaweed cultivation. It is possible to process seaweed biomass as a whole, but extracting its components – proteins, sugars and fats – individually yields a better price per kilogram. This will require new bio-refining techniques. 'But sustainability is at the top of the list of criteria', Wald stresses. 'Without sustainable sea farming there'll be no seaweed cultivation.'
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