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Name: Alexander Ebbing
Company / organisation: NIOZ

Description of the Innovation (ca. 250 words):
The Seaweed Continuous bioReactor or SeaCoRe system, is a chain of bioreactors that allow farmers to propagate clonal delayed gametophyte cultures at their kelp farm. The system is peer reviewed and published this year at the Journal of Applied Phycology, it is open-source, and already in use at a farm. The chain of bioreactors allow for the bulking of clonal gametophytes, the reliable production of sporophytes, and the ability to transport these cultures over larger distances. During the development of the system we aimed to adres the following issues: - No need for laboratories: o Our system is built in such a way that for at least 75 days you do not need sterile laboratory environments to successfully propagate kelp gametophytes at your farm. - Economic way of gametophyte propagation: o The prototype system was built for less than $2000, making it an affordable system to buy for most kelp farmers. - Reliable production of kelp sporophtyes: o Reliability is key in any enterprise, but is especially important for farmers. Every farmer needs this reliability to be able to explain the investment costs during planting season. Reliability is also key as a scientific foundation on which people can built better versions of the first system. - Open-source: o Open source systems are fairer and more approachable than systems that are patented. It allows for quicker adoption, faster improvements and will hopefully function as a catalyst for better versions that will come in the future.

What makes your innovation unique compared with other products? (ca. 400 words)
The SeaCoRe system introduces a new automatable way of delayed kelp gametophyte propagation. The novelty can be found in multiple facets. First, it is the first clonal gametophyte propagation system that has been fully peer reviewed in the world. To be clear, there have been publications before looking at bioreactors for the vegetative growth of kelp gametophytes. However, these studies never progressed beyond the vegetative growth phase of gametophytes. The SeaCoRe system addresses this follow-up phase, in which kelp gametophytes initiate sexual reproduction to form sporophytes. It also addresses the question of culture transportation, which as far as we know, have never been assessed. Second, the SeaCoRe system uses clonal gametophyte cultures, which are a relatively novel way of kelp cultivation. As far as we know there are no large scale kelp farms that successfully uses multiannual delayed gametophytes to seed their entire farm, making the system who aims to do this one of a kind. The aim of the SeaCoRe system is to bridge the uncertainties preventing the adoption of multiannual delayed gametophytes as seedstock for large-scale farmers. Third, is the aim to standardize the production process of kelp farming. This might seem a weird novelty at first, but within kelp aquaculture there is yet no such thing as standardization. Every university has its own way of researching/propagating seaweed, every farmer has its own way of farming kelp. Lastly, it aims to make the production process of kelp farming quantifiable for the first time, by making the farming steps compatible with each other. This will ultimately allow a farmer to

calculate how many meters of kelp farm a SeaCoRe system can produce, how effective the system is, and ultimately whether the technology becomes cost effective to operate.

What special new advantages does your innovation bring in terms of for example commercial, environmental and social factors? (ca. 400 words)

The main commercial advantage of the SeaCoRe system is that it allows for the usage of delayed clonal gametophytes as seed stock, and all the advantages that come with using delayed gametophytes. For example, delayed gametophytes can be kept in cultures for prolonged periods of time, can successfully be cryopreserved, there is still a lot of room for optimization, and they open up new possibilities for kelp breeding. From an environmental perspective it embodies a critical advantage that spore seeding does not have. By cloning gametophytes you can make sure that certain pathogens or invasive species are not introduced in pristine natural environments though the introduction of your kelp gametophytes. This is an aspect that is very difficult to do with spore seeding as your primary cultivation technique. From a social perspective its main advantage is that the SeaCoRe system is completely open-source. This prevents future monopolies trough patenting. Open-source also allows for peer review by farmers and scientists, ultimately catalyzing innovation in this new field of kelp cultivation.

For which market and target group was your innovation mainly developed? Who is likely to be the key customer group? (ca. 200 words)

The system was primarily designed as a blue print for research scientists and small scale farmers that want to tip their toes into the waters of delayed gametophyte kelp cultivation. In the long term it could function as the baseline upon which better versions are built that address the ever growing kelp farms in their quest to cultivate on a large scale on open oceans, using multiannual delayed gametophytes

Please give very briefly 3 reasons why you believe your innovation should win the Seagriculture 2022 Innovation Award:

The SeaCoRe system introduces a novel method of kelp cultivation, using multi annual delayed gametophytes, that in the long run allow for true large scale kelp cultivation. The fact that it is peer reviewed in the journal of applied phycology adds to the credibility of the functioning of the device. The fact that it is open source allows for external innovation by others, outside of the scope of the SeaCoRe project. This hopefully accelerates innovation, and with it speed up the time for true large scale cultivation of kelp to be realized.