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Seagriculture

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SEAGRICULTURE INNOVATION AWARD 2022

Name: David Bailey, Robin Littlefield, Ben Weiss

Company / organization: Woods Hole Oceanographic Institution (WHOI)

Description of the Innovation (ca. 250 words):

Researchers at the Woods Hole Oceanographic Institution (WHOI) have developed an automated underwater seaweed seed-string deployment device (Figure 1), through funding from the Pacific States Marine Fisheries Council (PSMFC). The device has a payload of two seed-spools (~125m), which are loaded on the automated line seeder. The device is then attached to the grow-line with quick connect clips, such that the grow-line does not need to be threaded through the seed-spool and the farm structure does not need to be disassembled for each grow line. Once clipped to the grow-line, the free end of the seed-string is fixed and the thrusters are activated with a waterproof switch. The two thrusters are angled providing both forward and rotary force to create an even wrap along the length of the grow-line. When the device reaches the end of the grow-line a kill-switch is triggered by the perpendicular supporting farm structure line and deactivates the thrusters allowing a farmer on the other side of the farm to secure the seed-string and detach the device. The farmer then attaches the device to the next line and the process is repeated in the reverse direction until the entire farm is seeded. Multiple units may be used to further increase efficiency of the farm seeding process.

What makes your innovation unique compared with other products? (ca. 400 words)

Existing methods of transferring seed-string to grow-lines requires the detachment of grow-line end terminations within the farm structure to pass spools over the line. The detachment of grow-lines from the larger farming system is labor-intensive and presents operational challenges as these farms rely on tension and precise grow-line length. A boat is then used to pull the grow-line out of the water as the boat moves down the length of the line while winding the seed-string onto the grow-line. Once at the end, the grow-line is again detached, and the empty seed spool is removed from the line and the grow-line is reattached to the larger farm structure. This process requires a boat to travel the length of each grow line and lift the line out of the water for seeding, exposing the juvenile seaweed to the elements. Juvenile seaweed is especially sensitive to low temperatures (below freezing), wind chill, and rain (freshwater) (Figure 2). The process must be repeated for each grow-line within the farm to seed the farm structure with juvenile kelp that will grow to be harvested.

Our device eliminates the need for grow-line attachment and detachment which will allow the farmers to seed much faster than traditional methods. The proposed method will substantially lessen the time the seed spool spends in the air, reducing the time of exposure to the elements from minutes to seconds to increase seedling survivability. Removing the above-surface component from seeding will also increase the weather window in which seeding can occur. The use of multiple self-spooling systems will reduce the

number of boat trips back and forth along the length of the farm for a greater savings in time, fuel, and reduced wear on equipment.

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

The underwater seaweed seed-string deployment device will increase the weather window for out-planting. This will ensure that farms are planted at the optimum time to maximizing yields at harvest. An increased seeding window will also allow for farm expansion, large farms will be able to be planted in the optimum time window regardless of weather. It will also remove many of the blank sections commonly found on grow-lines due to the problems associated with the common seeding method.

Commercial value:

- Lower operating expenses at out-planting
- Reduce blank spaces on grow-lines due to out-planting challenges: weather, chaffing on boat, etc.

Environmental value:

- Increase farm yield, which will increase the ecosystem services provided by the farm

Social value:

- Reduce labor needs during out-planting

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

Our target is seaweed farmers with over 500m of grow-line.

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

- Immediate benefit to the industry
- It removes many of problems associated with traditional seeding methods
- This technology has the potential to greatly reduce labor requirements and lower mariculture operating expenses.

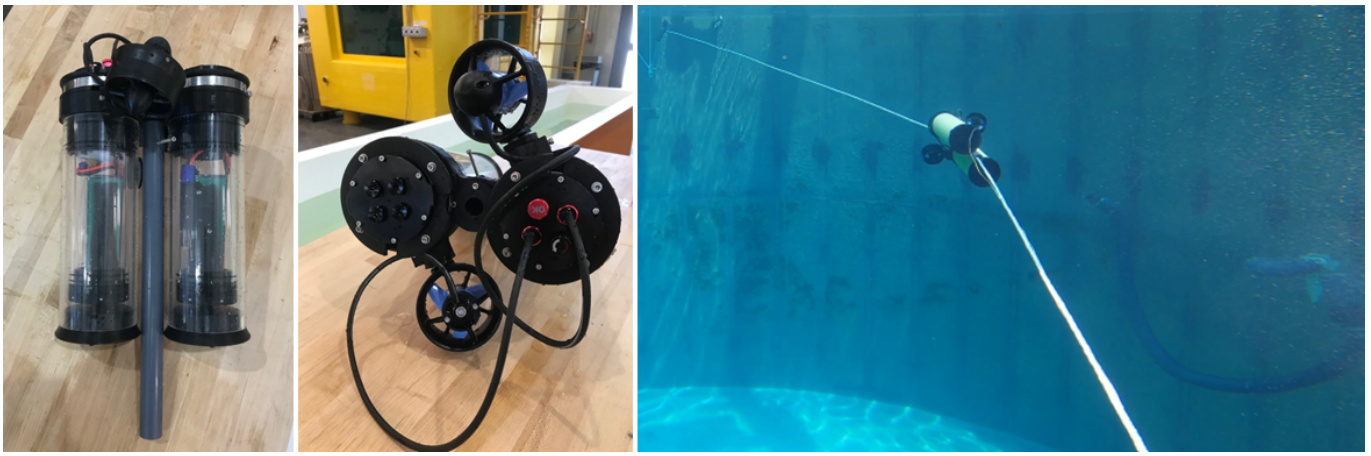

Figure 1. Prototype seed string deployment device and seed string deployment testing, July 2022

Figure 2. Kelp frozen to seed-spool during deployment in Kodiak 2021.