



Seven Lakes High School

Grow Green - Sugar Kelp Farming

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Reusing Offshore Platforms

- There are currently hundreds of decommissioned oil platforms in the Gulf of Mexico
- Our solution repurposes these rigs to create offshore seaweed farms through installation of automatic pelletization and seaweed harvesting systems

Pellet System

- After the Seaweed is harvested, the drying process will ensue using natural sunlight.
- Then, the seaweed needs to be crushed into a fine powder via a hydraulic press.



- The resulting powdered biomass will be put through a pellet mill to create lightweight pellets

Cost

- The costs for beginning a seaweed farm of 480 lines can be as low as \$271.30.
- From a 320-line farm, you can harvest 10 lines per day, which means that in a 4 day-week you can harvest 40 lines. Each line will weigh about 30 kg, thus totalling 1,200 kg of wet seaweed or 120 kg dry weight

Background

- Seaweeds have been harvested throughout the world as a food source as well as an export commodity for production of agar and carrageenan products.
- Sugar kelp has an especially high energy yield and is a good potential source of biofuel when it has access to abundant nutrients.
- The Gulf of Mexico in particular is situated in relation to the Mississippi River Valley such that the outpouring of nitrates and phosphates from farming concentrate in the gulf, leaving it vulnerable to eutrophication.
- In addition to providing food and shelter to creatures inhabiting its aqua ecosystem, seaweed forests can decrease carbon dioxide on the surface of the sea and in the atmosphere. Seaweed also absorbs dissolved nutrients from the water, which can prevent eutrophication caused by nutrient pollution.

Visuals



Process

- First the sugar kelp spores are settled onto nylon twine wrapped around a PVC pipe
- Once the spores have settled after 24-36 hours the spools are placed in indoor tanks under controlled conditions.
- After 4-6 weeks the juvenile plants are ready to be taken out to the site.
- The seed string plants are deployed on long lines between buoys
- The kelp is then harvested when it reaches the correct length.



Automation

- The harvesting of the seaweed will be done with a submersible robot that runs along the lines and cuts the seaweed that is the appropriate length. Once full it disengages from the lines and returns to the rig to deposit the seaweed where it's brought onboard via a automated crane.
- The Seaweed will then be pressed and dried and then sent into a pellet mill to create pellets for export.

Energy Use & Output

- Seaweed, once propagated using spores onto a rope, is self sufficient for many years. Seaweed is able to adapt its diet to the nutrients available, for example nitrogen isn't as abundant during the summer and fall. Once grown to the desired length, it can be chopped, leaving the root intact and can quickly create enough biomass to pelletize and make it easy for transportation.
- Sugar Kelp (*laminaria saccharina*) can produce about 50 liters of ethanol and 20 cubic meters of biomethane per wet ton.

Benefits

- Seaweed requires no fertilizers or pesticides and increases the water quality around it by balancing the nitrogen levels in the water.
- Nothing on earth sequesters carbon faster than kelp with some variations growing as rapidly as 50 cm a day. Covering 9% of the world's oceans with kelp forests could produce sufficient biomethane to replace all fossil fuel needs.
- Seaweed also promotes marine biodiversity and can help coral reefs bounce back.
- Seaweed grows quickly and is easy and efficient to harvest.(up to 10 times a day)

Sources

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