The ARLO Seaweed Processor

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INTRODUCTION

Ulva seaweed grows in masses at shellfish farms in the summer, now amplified by climate change. When the Ulva is removed by hand, farmers are left with thousands of pounds of wet, heavy, and smelly seaweed. Seaweed is an increasingly valuable bio-product and has the potential to be seen as a co-crop rather than a nuisance.

Fig. 1: Nuisance Ulva

PROBLEM STATEMENT

Collaborate with the Puget Sound Restoration Fund (PSRF) and PNW shellfish farmers to create and optimize a low-cost process for drying nuisance seaweed for transportation to use as compost material at local farms.

CORE REQUIREMENTS/SPECIFICATIONS

- Mobility
- Reduce Seaweed Weight
- Human Powered
- Affordable
- Suitable for Outdoor Conditions
- Operable by 1 Farmer
- Easy to Build
- Safe to Use

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DESIGN AND DEVELOPMENT

Ideas Considered:

- Large-scale salad spinner (Too dangerous)
- Heat-drying (Too risky without power)
- Pressing - Roller, Hydraulic, Toggle, Car Jack
- Passive drying

Two-Part Drying Process Selected:

Harvest Seaweed in Buckets → Press Seaweed → Passive Dry Seaweed → Transport as Compost

Through assessing different press mechanisms, the top priorities were determined to be:

✓ Mobility
✓ Single-toggle press model

The new challenge was to design a mechanism that could generate upwards of 300 pounds of force in one hand press.

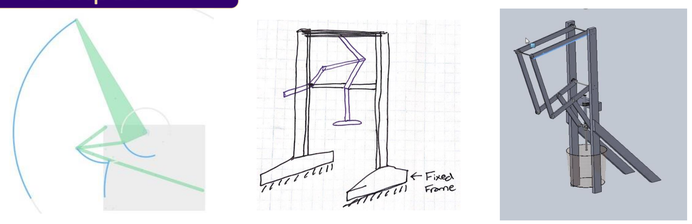

Fig. 2: Press linkages that were considered

ARLO is a **press mechanism** built from a **5-bar linkage** that generates a **high mechanical advantage**. The prototype was built using **wood and off-the-shelf materials** from a hardware store. In total, our first **prototype cost $360.**

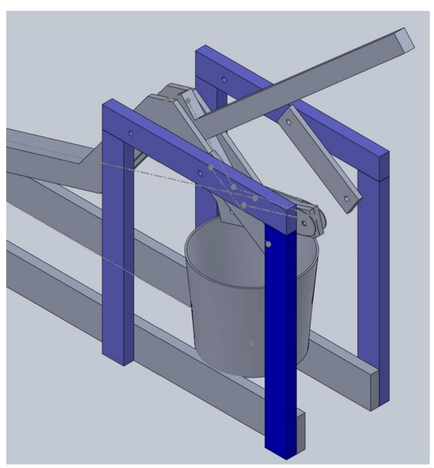

Fig. 3: ARLO CAD Model

RESULTS AND VALIDATION

Fig. 4: The PSRF student team field-testing the first prototype

Fig. 5: Point of Failure

While ARLO failed at the lever interface, our results include:

- Preventing the full force transfer to the seaweed
- 4 lbs of water removed
- The support of our validation data, seen right

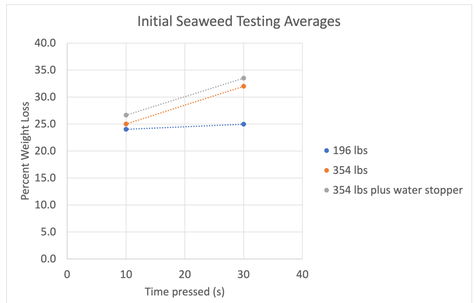

Fig. 5: Validation Testing of Seaweed pressing with Human weight

CONCLUSION & FUTURE WORK

For future iterations, the team recommends to use upgraded materials such as:

✓ Reinforced aquatic lumber (Estimated ~ $1000)
✓ Metal joints for input force bearing loads

The Arlo will also be deployed coupled with a passive drying system.

Acknowledgements

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Mechanical Engineering Capstone Exposition

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