Salico -

Oahu Trip Recap & Updates

11.12.2024

AGENDA

1. **GENERAL**
2. **DOES**
    - Pond set up observations
        - Ropes, poles, sprinklers
        - Distance between plant cones
    - Water quality
    - Tea leaf harvester
    - Claw vs. Roller
        - Material and texture
    - Measurements
        - Force
        - Dimension
        - Speed
3. **DESCOPING**
    - Descoped design goals
    - Farm modifications needed
4. **IMPLEMENTATION IDEAS**
    - Farm modifications needed
    - Actuation methods

Visiting Wenhao was a success!

- Got all our planned DOEs done
  - Collected data for our second prototype
  - Our current prototype was not a total fail, but we will need to descope for our time and resources
- Very valuable experience to gain insight on the operation
- Had a great time speaking with Wenhao and learning all about him and the farm
  - He was very kind and hospitable!

POND SET UP OBSERVATIONS

Platforms are sheets of HDPE, the cones are stuck inside quite tightly with undersized holes.

There are pipes and ropes along the ponds, also sprinklers -> booby traps for traversal

The rows are only fixed on the ends, and can bow and move in the water.

Spacing between cones is always 6 in, however space between growth is different:

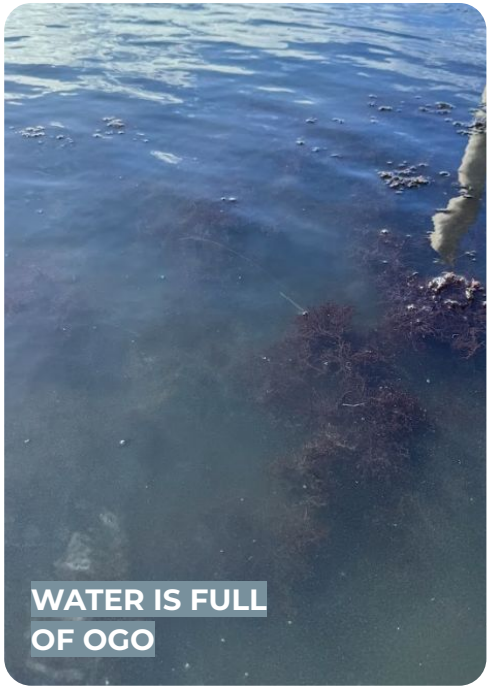
SPACING

Spacing between cones is always 6 in, however space between growth is different. Measurements of 5 spaces:

X Distance (mm)	Y Distance (mm)
0	0
35	20
60	30
75	30
100	35
120	55

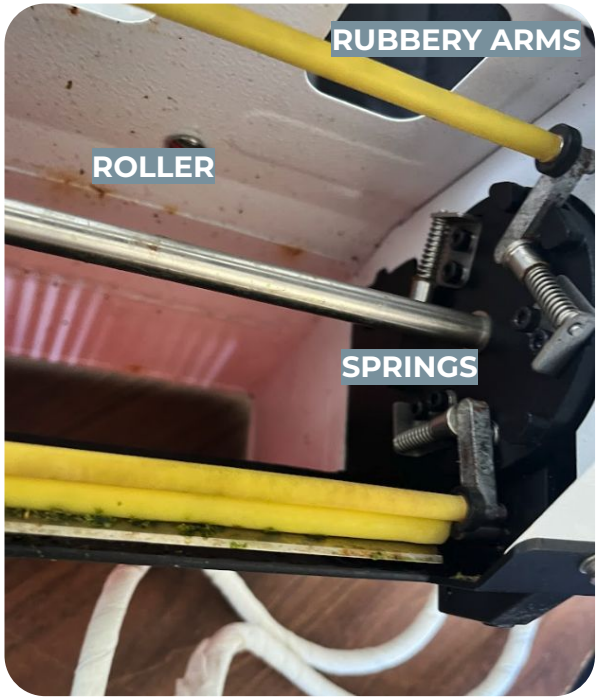
WATER QUALITY

Ogo is a type of Hawaiian seaweed and actually one of their main crops, it's all over the pond floors and cleans the water (black ish seaweed). They float around the water (no roots). No propellers for traversal.



TEA LEAF HARVESTER

Tea leaf harvester is light enough to be carried but bruises the plant. Form factor and design can be used for inspiration.

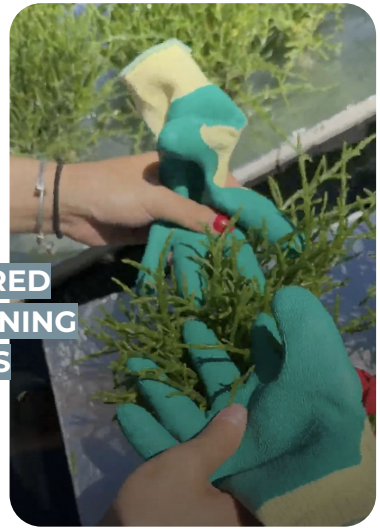


CLAW VS. ROLLER

Claw mechanism

Very hard to thread the claw prongs into the plant stems without destroying

Yield is low when pulling, would need to thread first then tighten somehow then pull (still not great outlook)



Roller

Worked decently and proves to be a promising path forward!

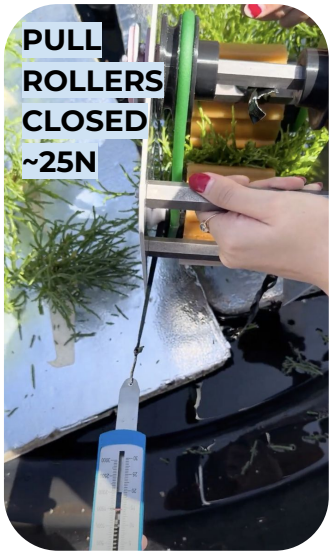
MATERIAL/TEXTURE

Roller material

- Verified that plastic alone immediately grinds the plant BAD so material needs to be squishy
- We got textured latex gardening gloves (green gloves) -> stays grippy when wet GOOD
- Tried nitrile gloves, not as good as latex
- Tried to wrap urethane in plastic dry wall patch mesh -> seemed to be ok but then we found out it was fibre glass... (but path forward with squishy inner and textured outer of roller)

FORCE: ROLLER COMPRESSION AND PULL FORCE

PINCHING: Should have an adjustable spring for the pinching force since a slight adjustment can change whether woody or tender parts will be picked.



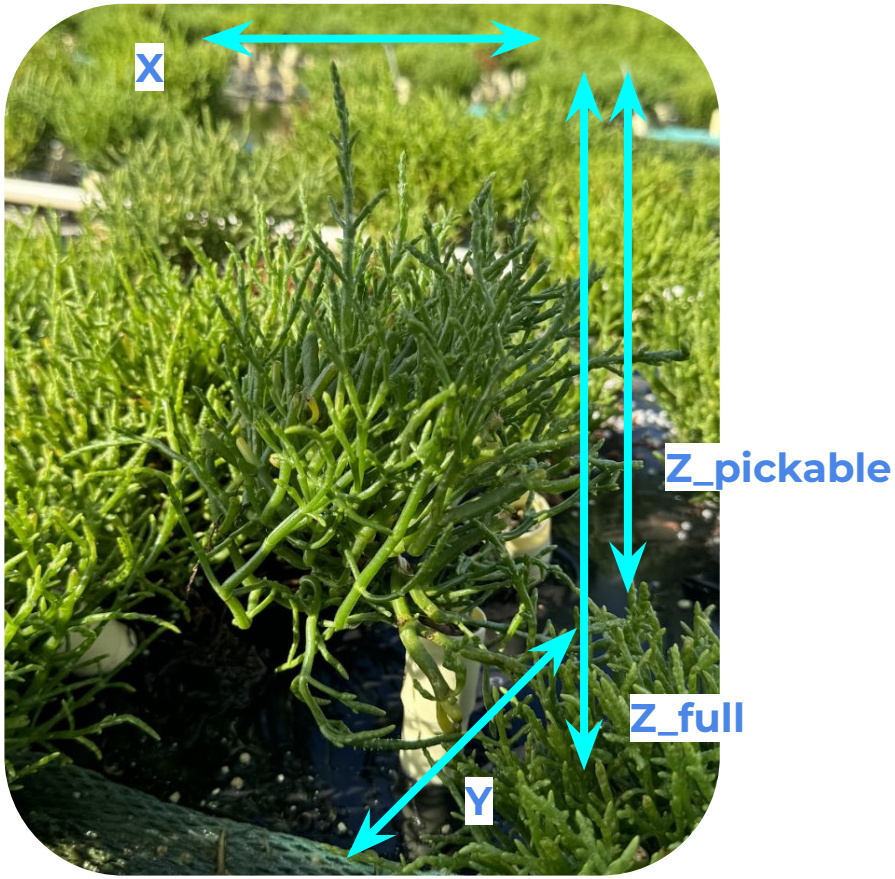
Force to pull medium out: ~15-25N minimum, depends on root growth

Force to pull cone out of platform: from ~25N to well above 30N

Density of plants (sparse case): approximately 70 tips for 100x110x85mm box.

Force (N)	# of Tips	N/tip
20	30	0.67
2.5	5	0.50
15	50	0.30
10	32	0.31
17	45	0.38
12	40	0.30
15	35	0.43
10	40	0.25
20	35	0.57
20	40	0.50

DIMENSIONS: AVERAGE SIZE OF PLANT



X (mm)	Y (mm)	Z_Full (mm)	Z_Pickable (mm)
160	135	120	80
180	125	135	55
155	130	140	85
145	110	150	85
160	120	155	130
200	180	155	95
190	150	160	85
100	100	110	50
105	105	140	45
150	150	140	75

OPTIMAL SPEED FOR HARVESTING

~ 80 frames

30 fps

$$? \frac{\text{rot}}{\text{min}} = \frac{1 \text{ rot}}{80 \text{ frames}} \cdot \frac{30 \text{ frames}}{1 \text{ s}} \cdot \frac{60 \text{ s}}{\text{min}} = 22.5 \text{ RPM}$$

$$= \sim 23 \text{ RPM}$$

~23 RPM

MODIFICATIONS TO THE FARM

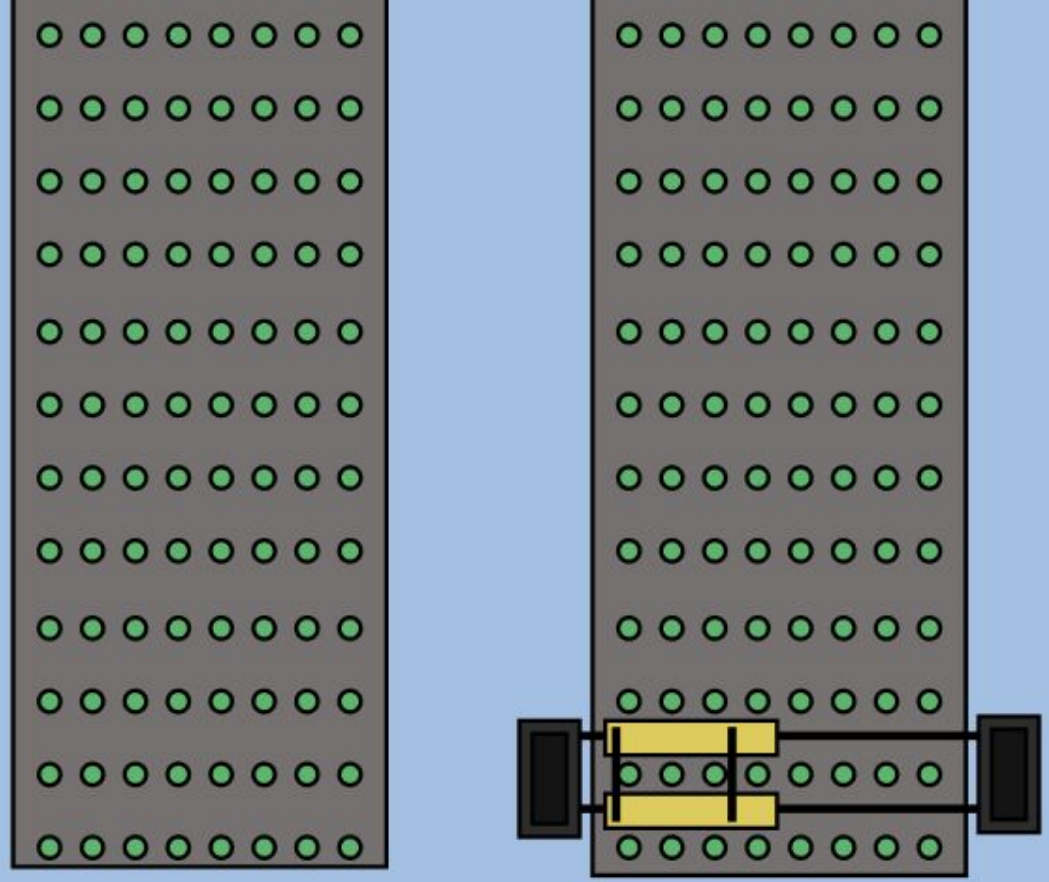
#1 Remove every other row to create space for alignment and apriltags

#2 Straighten the cones by adding ribbing

Descoping

#1 Picking half a row at a time

#2 Human-guided repositioning for each row



Implementation

#1 Top-down picking approach with multiple passes (most similar to our tests in Hawaii)

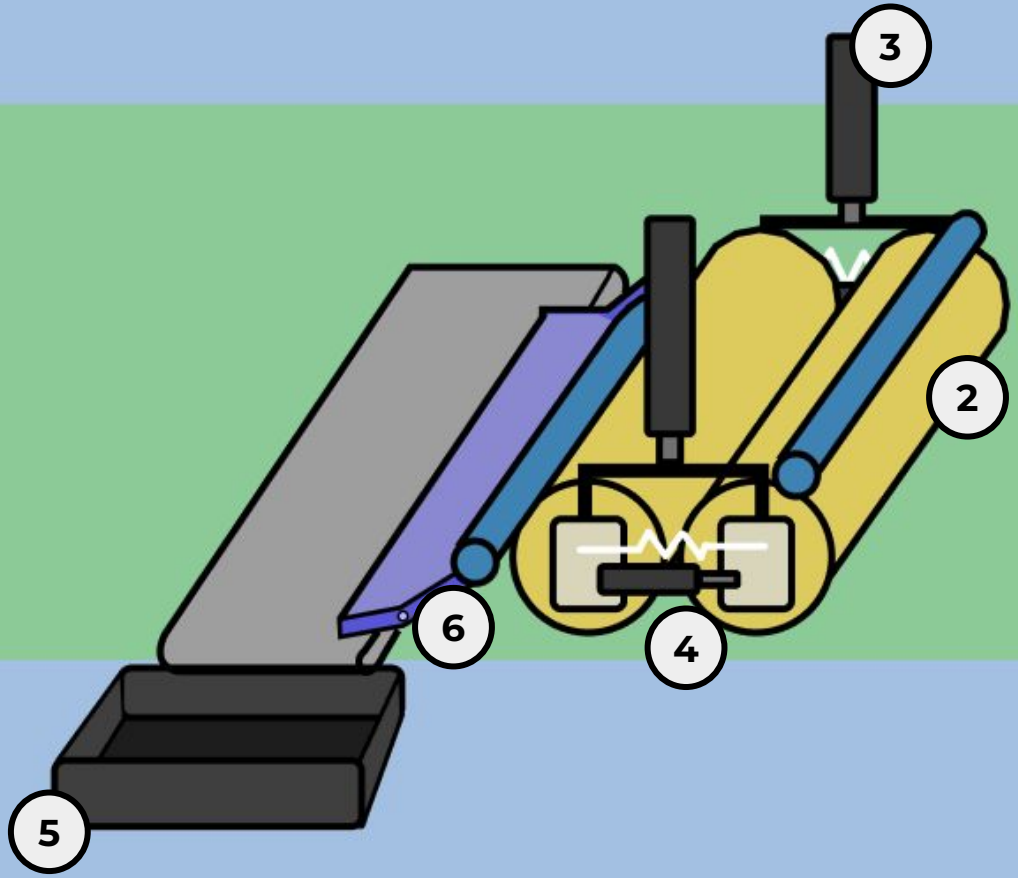
#2 Roller material will be urethane with a texture latex sleeve

#3 Pistons and springs for up down and in out motions

#4 One motor for each roller, direct drive

#5 One sided collection bin, tips pushed in using brushes and air

#6 “Hinged” ramp for temporary storage in lower position



Thank you!