Salico
Oahu Learnings

10.29.2024

AGENDA - DOEs

- GENERAL
  - Drone video of farms
  - Pond set up observations
    - Ropes, poles, sprinklers
    - Distance between plant cones
  - Water quality
  - Tea leaf harvester
- MECHANISM TESTING
  - Claw vs. Roller
- FORCE MEASUREMENTS
  - Roller compression
  - Force to pick plant
  - Force to pull medium out
  - Force to pull cone out of platform
- DIMENSION MEASUREMENTS
  - Average shape of a plant
  - X, Y, Z of plant size
- MATERIAL AND TEXTURE TESTING
- OTHER
  - Optimal speed for testing
  - April tags
  - Camera movement for detection

DRONE FOOTAGE

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:

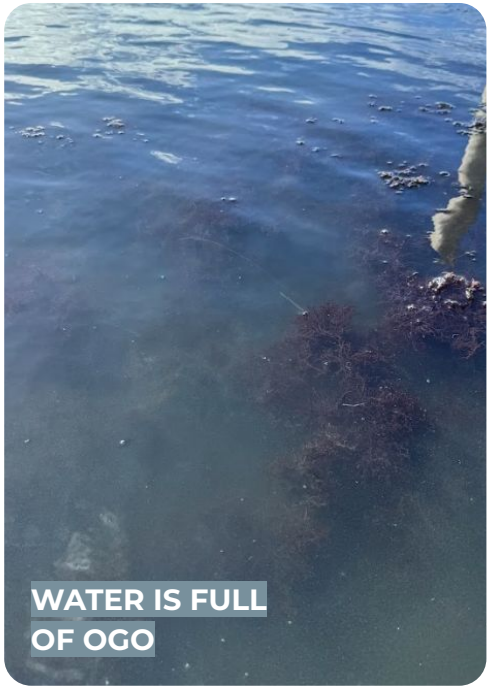
SPACING

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

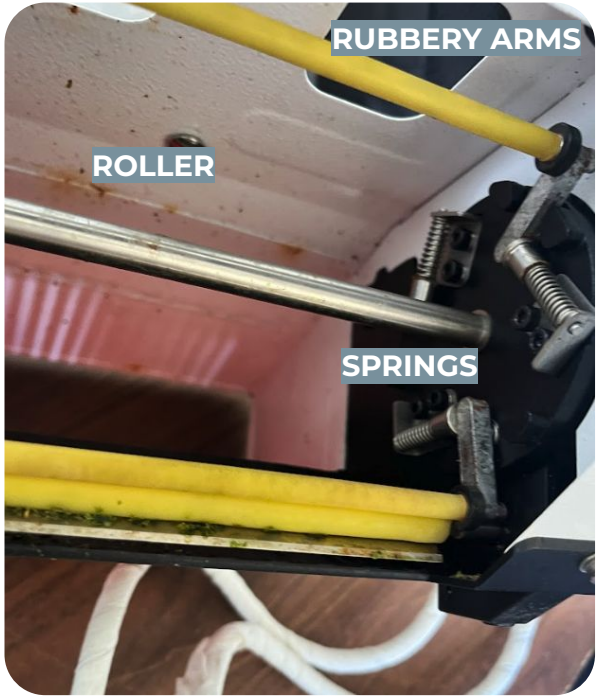
WATER QUALITY

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.

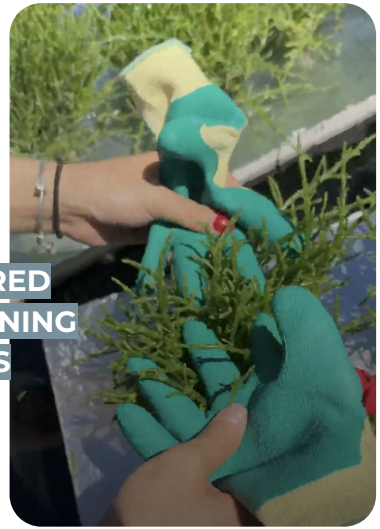


CLAW VS. ROLLER

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)



LATEX TEXTURED GARDENING GLOVES

Roller

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

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 PLANTS

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

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

OPTIMAL SPEED FOR HARVESTING

~ 80 frames

30 fps

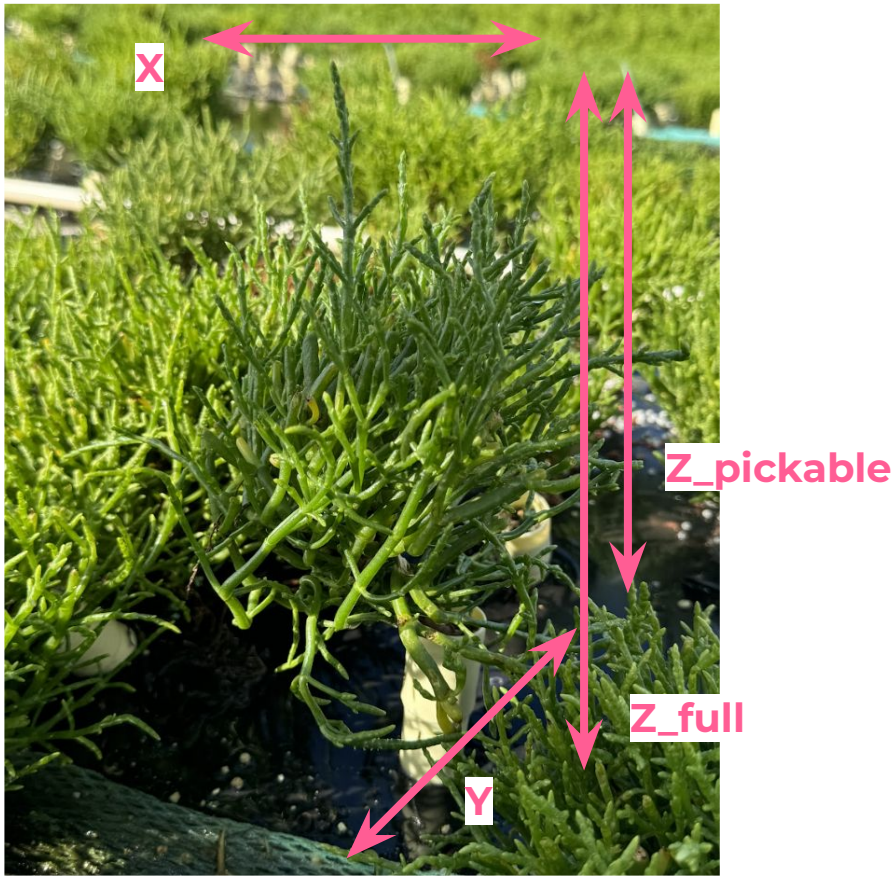
$$? \frac{\text{rot}}{\text{min}} = \frac{1 \text{ rot}}{80 \text{ frames}} \cdot \frac{30 \text{ frames}}{1 \text{ s}} \cdot \frac{60 \text{ s}}{\text{min}} = 22.5 \text{ RPM}$$

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

~23 RPM

AVERAGE SHAPE OF PLANT

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

Cargo

We can probably reuse his black bins as storage - they are very sturdy and float well

Force to pull cargo along when empty: basically 0 N, when we placed a heavy ass car battery inside: from 0-15N depending on acceleration, we took videos to find acceleration here

Main things to add: flexible connection point, cover to shield plants from the sun

OTHER

- **April tag stuff and camera movement videos** uploaded here @ye @danielq987
    - let us know if you want us to do something diff tmr
    - some of the rows naturally had cones tilting to either side and had a row down the middle that was clear to put the tags but not always, could think of other ways to identify rows -> either having a sacrificial column full of april tags, or using lines instead of tags, etc. let us know what you think
    - max also took videos as the camera, i took pictures of how high up he was holding it
    - at that height he **could not see entire row unless using 0.5x lens**

- We noticed lots of cones are tilted but plant will still grow upright -> we could propose change of cone geometry to Wenhao to ensure cones stick upright in platform. When Max measured z placement heights he straightened the cone.
    - Also discussed possibility of adding a cone attachment for more uniform plants.

- Tips get stuck in the belt sometimes -> need cover

- Discussed the need to be able to hold the plant up (the drooping branches) to get a full and good harvest
    - Must brainstorm ideas and run by Wenhao

- Must think about easy ways to do simple sorting
    - I think sorting between 2 sizes is enough, one "big" one "small"

QUESTIONS

- one vs whole row
- top down vs bottom up
  - getting something to the bottom?
  - how small for rollers?
  - Continuous or discrete plant contact?
  - size vs pulling effectiveness?
- tusks?
  - sensing per row, placement of april tags?
- make cones vertical?

Thank you