Auger Mass and Volume Calculations

We performed calculations on the current auger prototype to determine how much this design iteration can handle.

**Volume Calculations:**
Packing density = 30% full
Threads = 6.2
Volume per turn = 4032 mm$^3$ / rev
  - **Volume = 4.032 cm$^3$/rev**

To convert that to mass, we performed a quick experiment to determine the density of breadfruit. We used the dried shred samples, a scale, and a graduated cylinder.

**Density Calculation:**
10 g breadfruit put into 50 mL water
  - 9 mL water increase = 9 cm$^3$
  - $\rho = \frac{10g}{9 cm^3} = 1.11 g/cm^3$

**Mass per rev:**
mass = $\rho$ * v
mass = (1.11 g/cm$^3$) * (4.032 cm$^3$/rev)
**mass = 4.476 g/rev**

We then compared this to our target production rate of 4 kg/hr, as well as the volumetric rate that the country kitchen stones can handle. This helped us determine a new target volumetric rate, which helped us alter our auger design to reduce volume.

**Target rate:**
(48 rev/min) * (60 min/hr) = 2880 rev/hr
(4 kg/hr) / (2880 rev/hr) = 0.001389 kg/rev = **1.39 g/rev**

We felt that 4.476 g/rev was slightly too high compared to the target value, and we don’t want to overwhelm the grindstones or encourage clogging.

If we now aim for 3 g/rev:
(3 g/rev) / (1.111g/cm$^3$) = 2.700 cm$^3$/rev

**Stones - Country Kitchen:**
(295.735 cm$^3$/min) / (80 rev/min) = 3.697 cm$^3$/rev

Therefore, the volumetric rate that 3 g/rev would produce is lower than the volumetric rate that the country kitchen stones can handle at 80 rev/minute. We feel this is then a safe estimate.