

# Prototype V1, the honest spec sheet.

Polyponic is a solar powered aquaponics garden for balconies and apartments. A 20 litre aquatic world below, herbs and microgreens above, connected by the nitrogen cycle and never plugged into a wall.

|                  |                                                                                   |
|------------------|-----------------------------------------------------------------------------------|
| FOOTPRINT        | 44 x 29 cm, about a bar stool of balcony space                                    |
| HEIGHT           | 44 cm                                                                             |
| WATER VOLUME     | 20 litres                                                                         |
| OPERATING WEIGHT | approx. 32 kg, moved empty and in parts                                           |
| GROWING SPACE    | 6 plant positions plus 2 microgreen beds                                          |
| LIVESTOCK        | 12 to 15 cherry shrimp plus 4 to 5 snails (default)                               |
| POWER            | 30 W solar panel with LiFePO4 battery, 12 V, fully off grid                       |
| BATTERY AUTONOMY | approx. 2 to 3.5 days of cloudy weather (modeled)                                 |
| PUMP             | 4 W, duty cycled, sips energy                                                     |
| MATERIALS        | glass tank, UV stable plastics, food grade tubing                                 |
| TARGET PRICE     | \$129 to \$199 per garden plus \$79 to \$129 power module (target, not a promise) |

**Fig. 1 Energy and water loop**

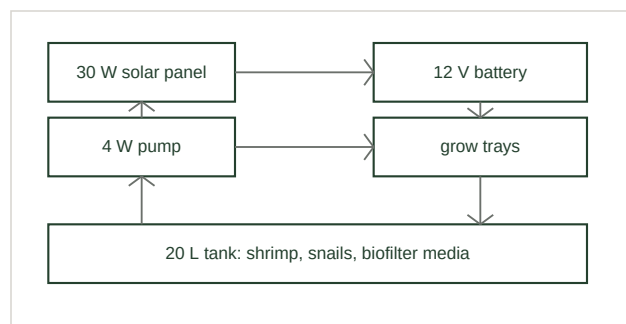
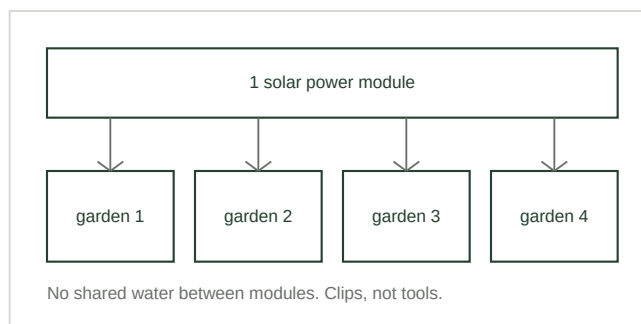


**Fig. 2 Modular expansion**



# How each number was produced.

Calculated means a first principles engineering model produced it. Modeled means a simulation produced it against reference data. Target means design intent that has not been measured yet.

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## Biofilter margin, 6.8 to 18x

CALCULATED

Nitrification capacity of the clay pebble bed compared with the ammonia load of worst case feeding, using published surface area conversion rates from FAO manuals and peer reviewed aquaculture literature.

Pending: An eight week cycling trial with water chemistry logged on the first prototype.

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## 12 of 12 months of solar operation

MODELED

Hourly energy balance of a 30 Wp panel against pump duty cycle and controller draw, run against a Los Angeles typical meteorological year with derating for temperature, soiling and conversion losses.

Pending: An instrumented outdoor run recording panel yield, battery state and pump runtime.

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## 300 years of simulated weather

MODELED

The same energy model driven by resampled sequences of the reference weather record, checking every simulated year for a battery depletion event.

Pending: Validated by the outdoor solar run above.

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## Battery autonomy, 2 to 3.5 days

MODELED

Usable battery energy divided by daily pump and controller consumption with no solar input, spanning normal and reduced duty cycles.

Pending: A bench discharge test at both duty cycles, measured to the low voltage cutoff.

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## 9 spill scenarios

CALCULATED

Static water level analysis of each failure path, comparing the volume that can move with tank freeboard and tray retention capacity.

Pending: Physical leak, overflow and tube disconnection tests on a filled prototype.

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## Noise target of about 40 dB

TARGET

Design intent from the pump datasheet, the decoupled pump mount and a return outlet kept below the water surface.

Pending: A measured sound pressure level at one metre, published whatever it reads.

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## 10 minutes per week of maintenance

TARGET

Estimated from feeding, test strip and top up routines in the care manual, plus a monthly partial water change.

Pending: A logged maintenance record kept over the full prototype trial.

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## 28 failure modes analyzed

CALCULATED

A failure mode and effects analysis across structure, hydraulics, energy and biology, each mode given a designed mitigation.

Pending: A review pass after physical testing, adding any mode the prototype reveals.