

GRAY WATER REUSE IN SUSTAINABLE URBAN AGRICULTURE

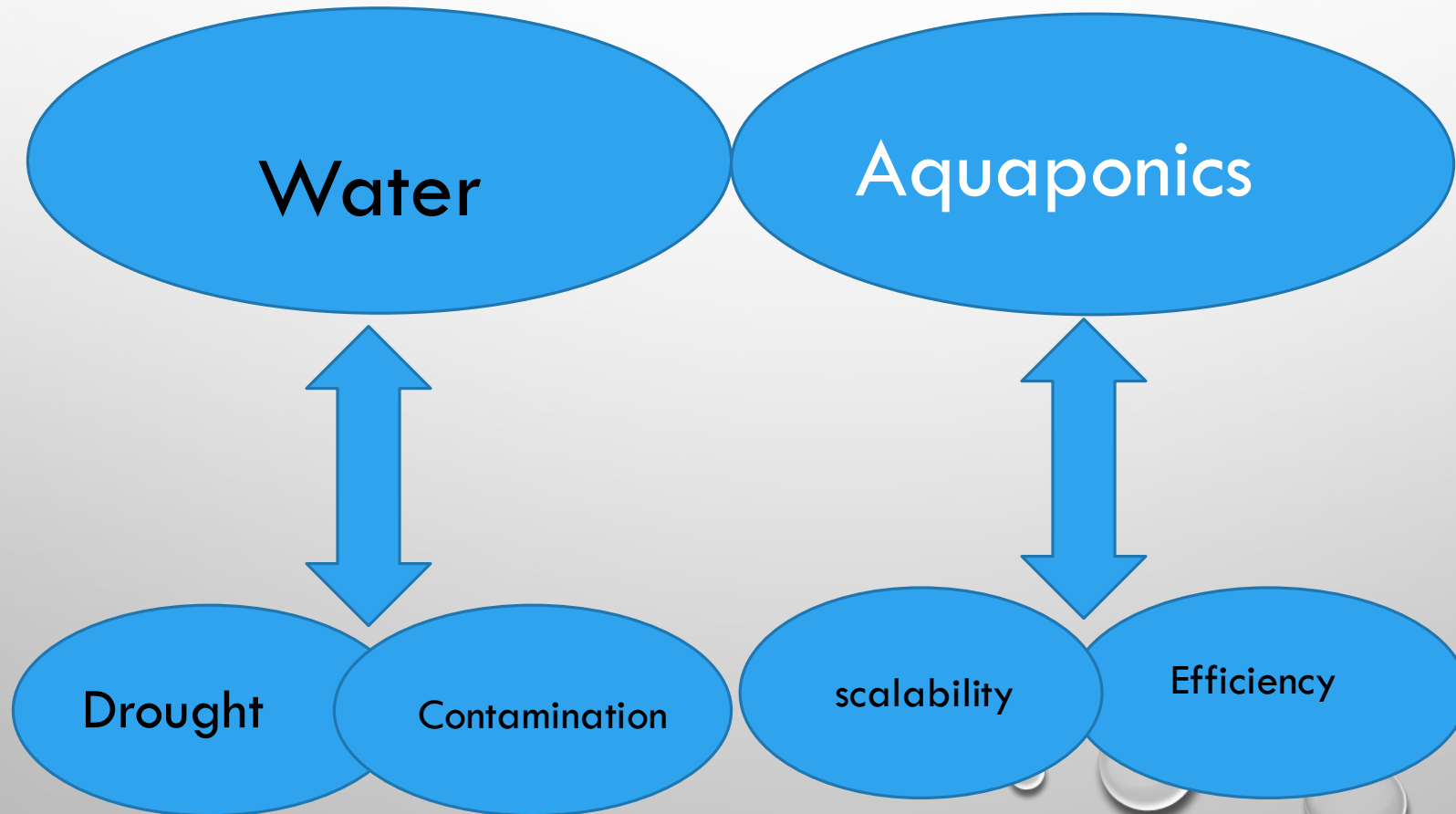
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OUTLINE



DROUGHT

- **THE DROUGHT HAS NOT ENDED**
- CALIFORNIA HAS BEEN EXPERIENCING PROLONGED DRY CONDITIONS. **SEVEN OF THE NINE YEARS SINCE 2007** HAVE BEEN DRY. CALIFORNIA ALSO EXPERIENCED RECORD WARMTH DURING THIS TIME, 2014 AND 2015 WERE, RESPECTIVELY, THE WARMEST AND SECOND-WARMEST YEARS IN **121 YEARS** OF STATEWIDE AVERAGE TEMPERATURE RECORDS

WATER AND AGRICULTURE IN CALIFORNIA

**More than 80% of state
water is used in agriculture**

NITRATE RUN-OFF

- CONTAMINATED GROUNDWATER
- TULARE LAKE BASIN AND MONTEREY COUNTY
- **MORE THAN 90 MG/L NITRATE**
- CALIFORNIA DEPARTMENT OF PUBLIC HEALTH MAXIMUM CONTAMINATED LEVEL 45 MG/L
- 2.5 MILLION PEOPLE

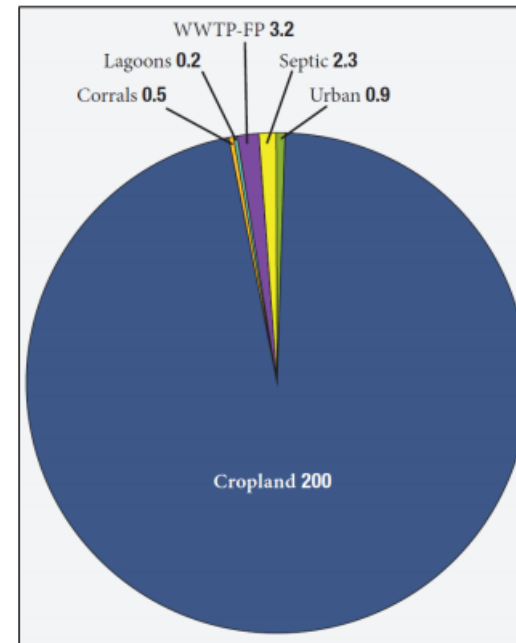


Figure 1. Estimated groundwater nitrate loading from major sources within the Tulare Lake Basin and Salinas Valley, in Gg nitrogen per year (1 Gg = 1,100 t).

AQUAPONICS HISTORY

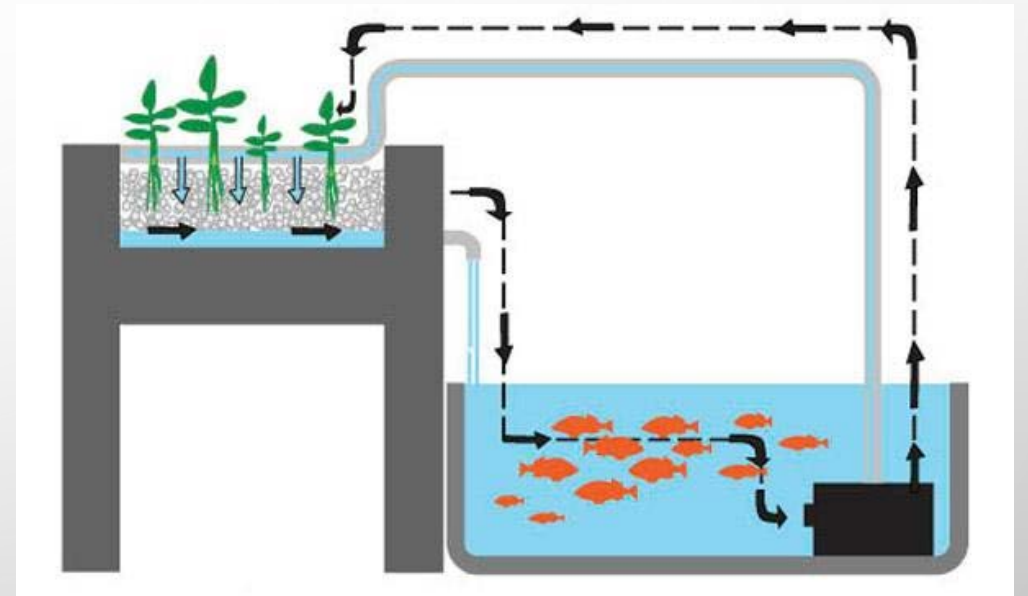
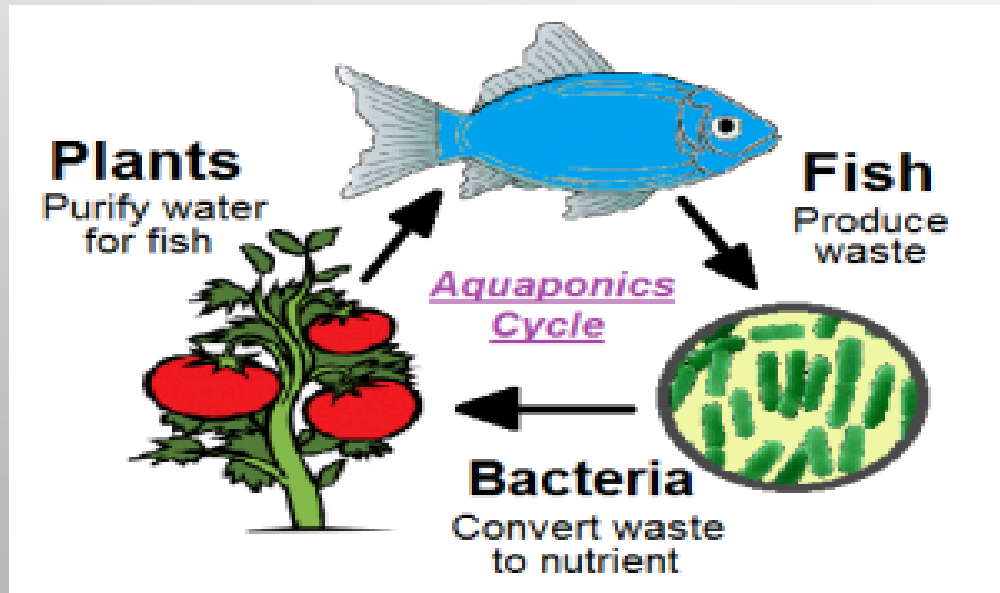
- AZTEC CULTIVATED AGRICULTURAL ISLANDS KNOWN AS *CHINAMPAS*.
- LONG BEFORE THE TERM “AQUAPONICS” WAS COINED, THE AZTEC INDIANS RAISED PLANTS ON RAFTS ON THE SURFACE OF A LAKE IN APPROXIMATELY 1,000 AD



WHAT IS AQUAPONICS?

- Hybrid of aquaculture and hydroponics

How does it work?



WHY AQUAPONICS?



- Water conservation
- Zero Nitrogen discharge
- No fertilizers
- Closed-loop cycle





Is Aquaponics using 90%
less water compared to soil
farming?

IS AQUAPONICS SCALABLE?

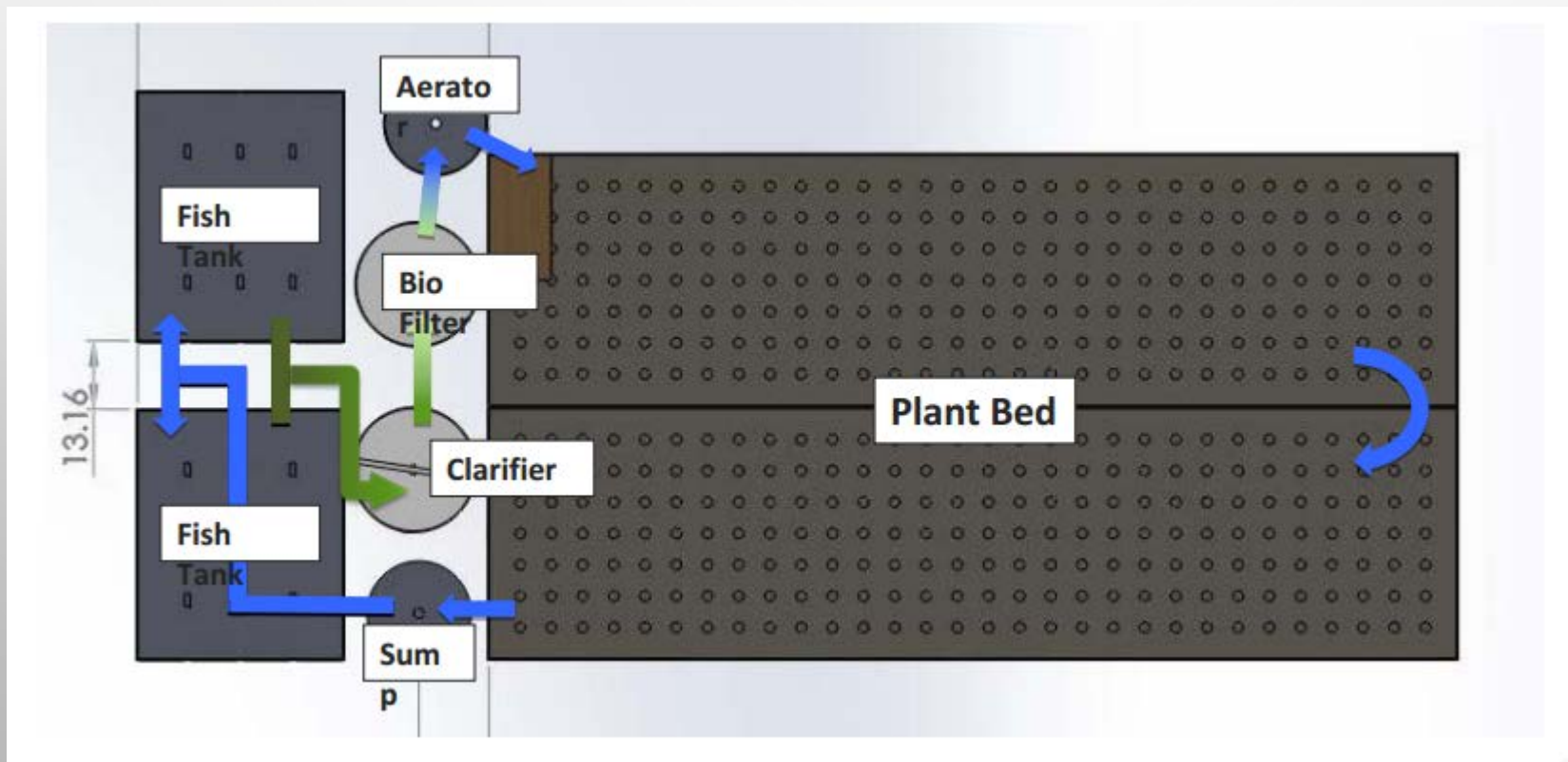


AQUAPONICS IN CAL POLY POMONA

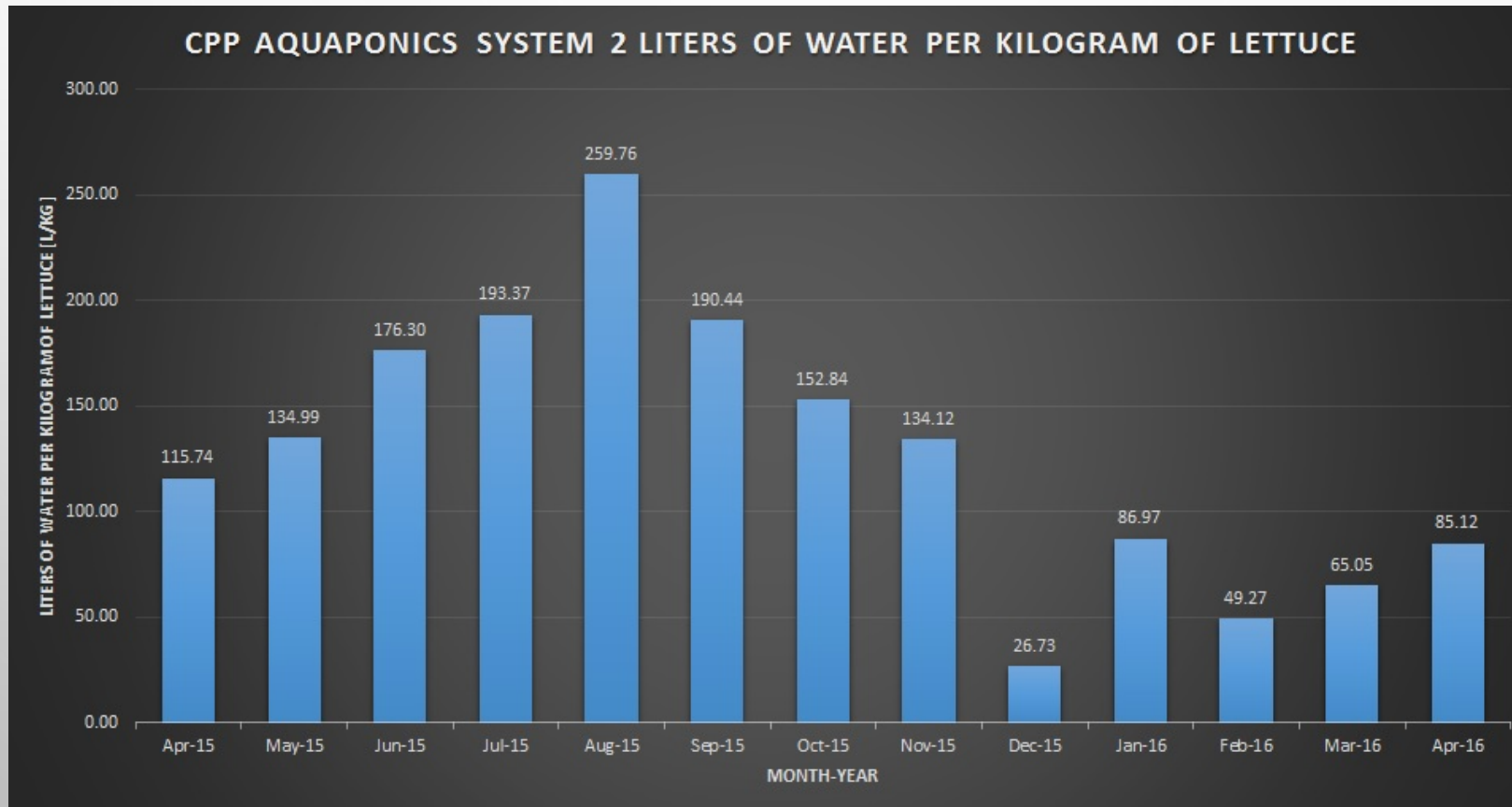


AQUAPONICS IN CAL POLY POMONA

- 120 FT² GROWING BED, 250 PLANTS, 750 GALLONS OF WATER OVERALL



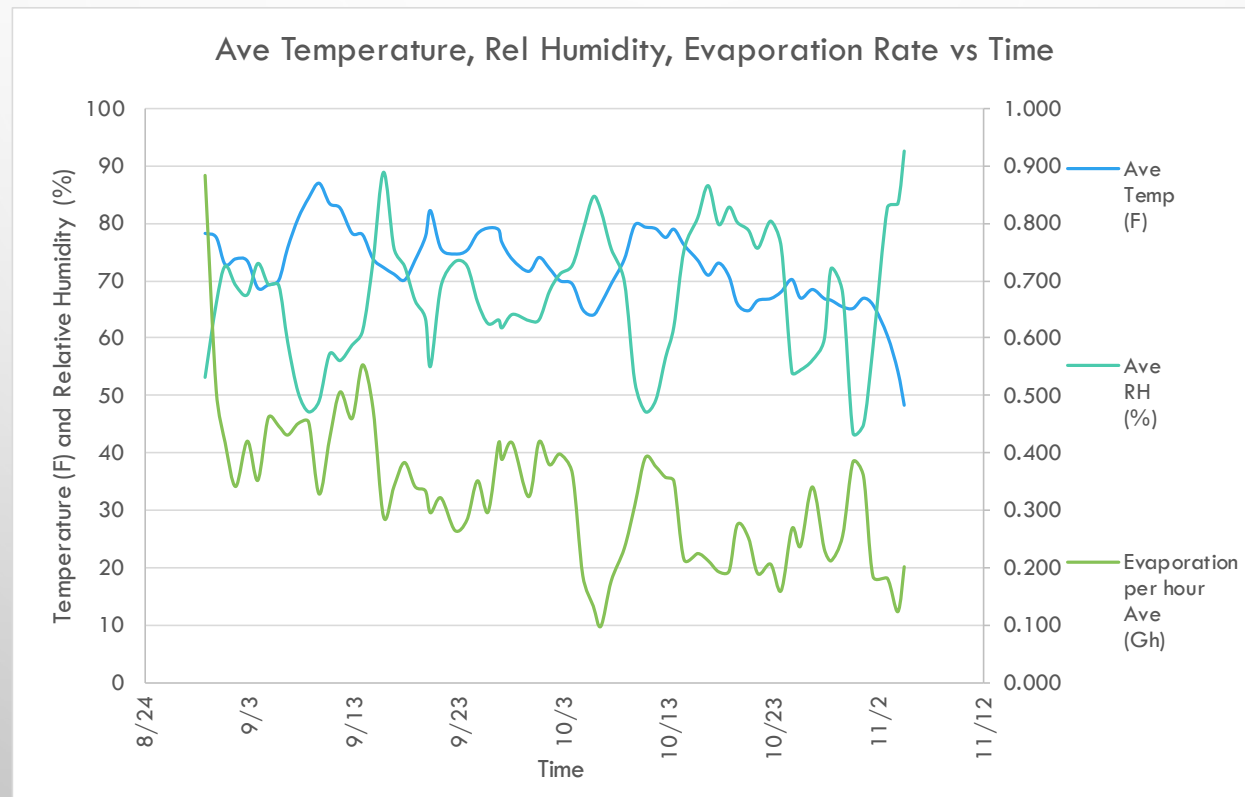
WATER EFFICIENCY



LOCATION	YIELD
Global Average	237 liters/kg
California Average	115 liters/kg

Aquaponics annual average	Aquaponics average excluding Summer	Compared with CA average
128 liters/kg	106 liters/kg	(+ 11%)- (-25%)

EVAPORATION: 80-90% OF WATER LOSS

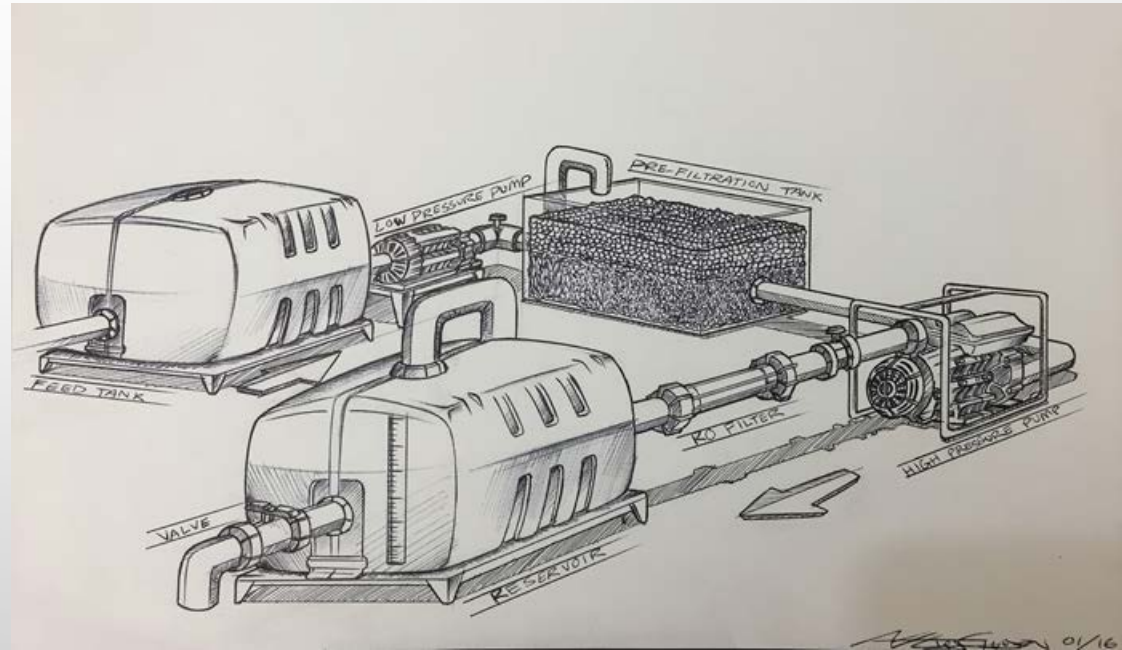


NEXT STEPS

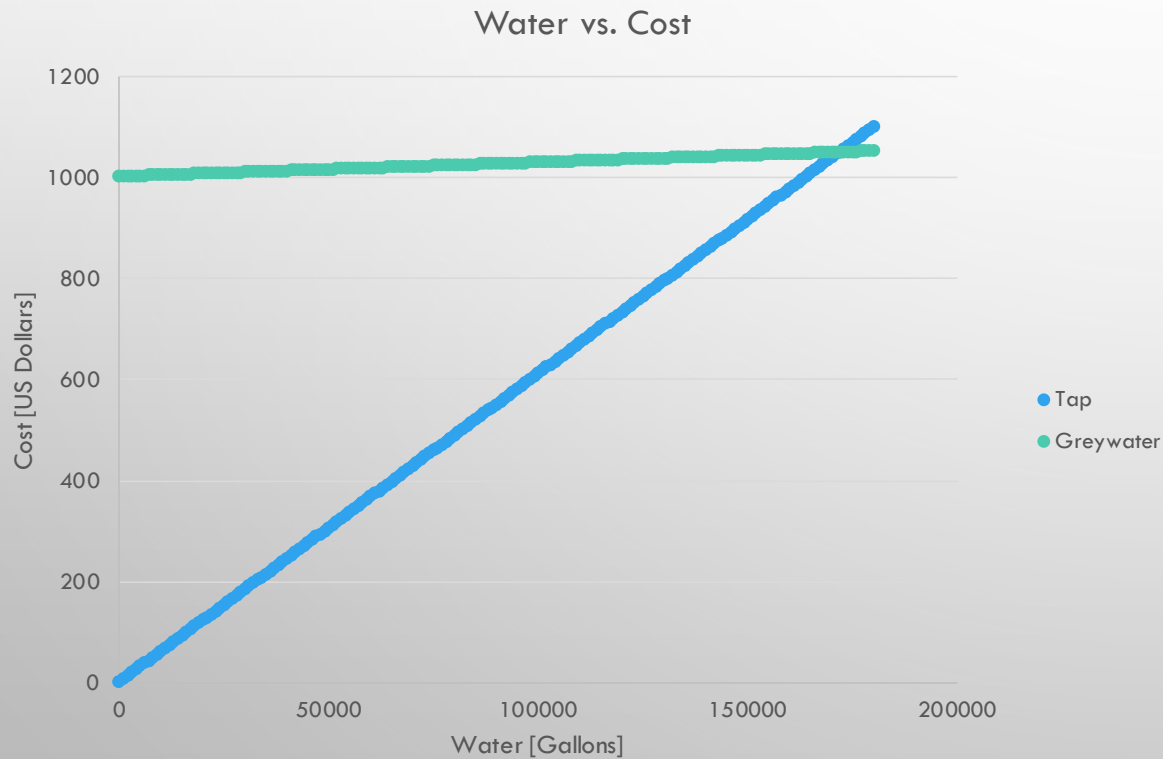


GRAY WATER REUSE

- WASTE WATER
- FILTERS
 - MECHANICAL
 - ULTRAFILTRATION
 - REVERSE OSMOSIS
- INTEGRATE INTO AQUAPONICS SYSTEM
- POWERED BY SOLAR ENERGY



GRAY WATER BREAK-EVEN

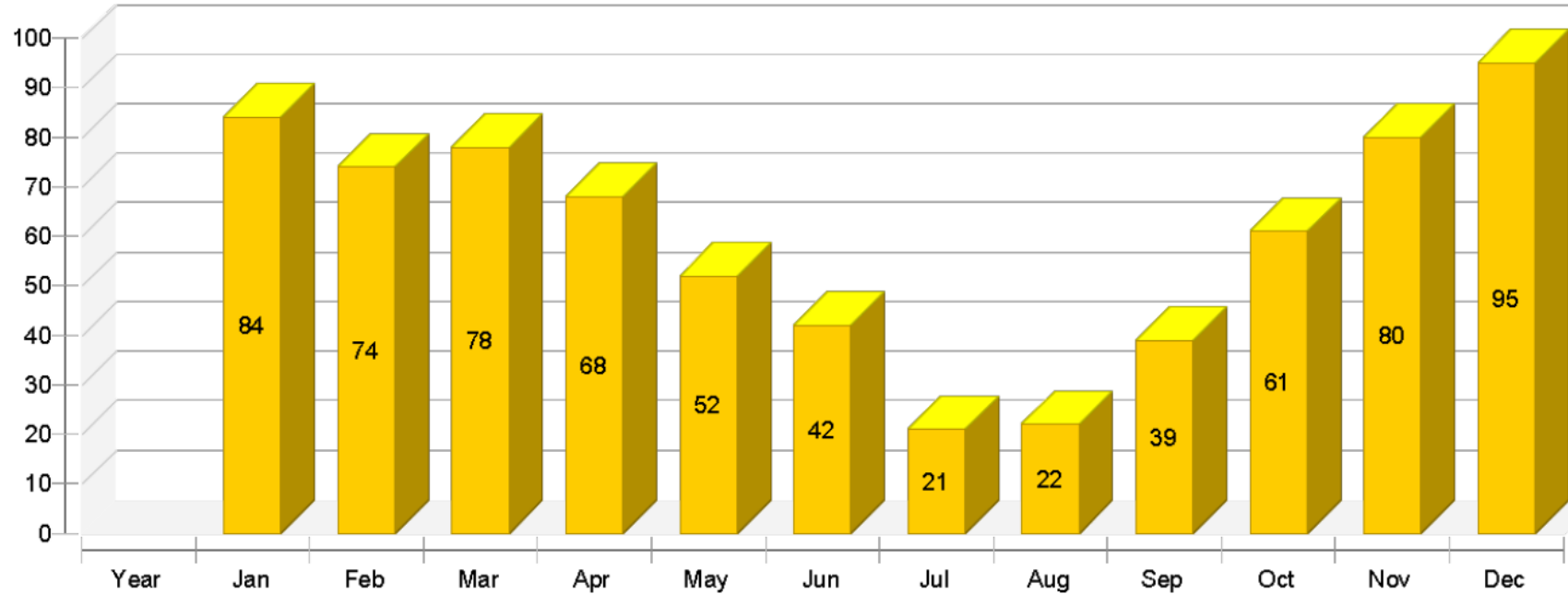


- INITIAL COST OF GREYWATER SYSTEM: \$1,000
- COST OF TAP WATER IN LOS ANGELES, CALIFORNIA: \$0.0061 /GALLON¹
- PURIFIED GRAY WATER: \$0.00027975/GALLON
- BREAK-EVEN POINT IS APPROXIMATELY 172,000 GALLONS OF WATER
- OUR ANNUAL CONSUMPTION WAS 6000 GALLONS

SOLAR ENERGY

Total fuel and/or electrical energy consumption of the system [Etot]

kBtu



Collector area

236.2 ft²

SUMMARY

- AQUAPONICS IS A WATER EFFICIENT ENVIRONMENTALLY FRIENDLY FOOD PRODUCTION SYSTEM.
- IT'S WATER EFFICIENCY CAN GROW UP TO 25% COMPARED TO AVERAGE CALIFORNIA WATER USAGE FOR LETTUCE
- THE RESULTS OF ANNUAL MEASUREMENT ON THIS PILOT PLANT CAN BE USED TO EVALUATE THE SCALABILITY OF AQUAPONICS AS AN ALTERNATIVE AGRICULTURE SYSTEM FOR THE FUTURE.

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QUESTIONS?

