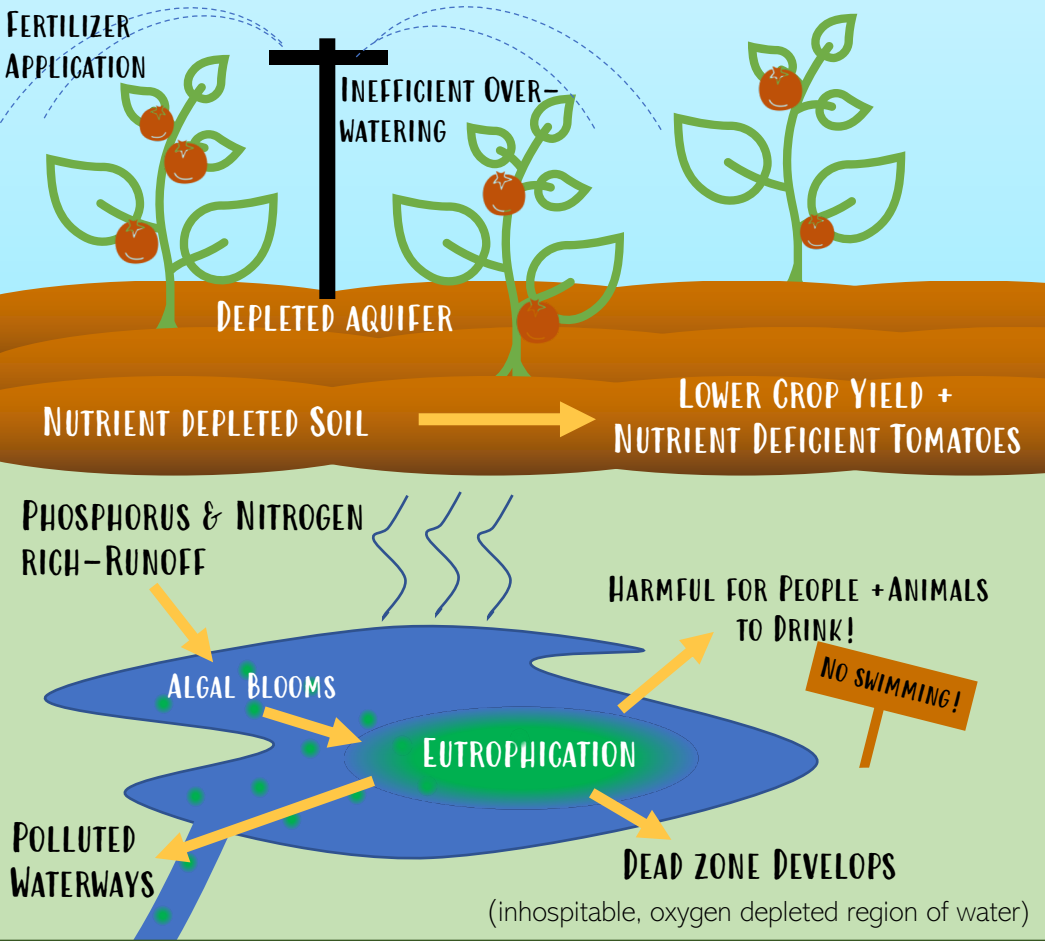


SUSTAINABLE AGRICULTURE

PROBLEM

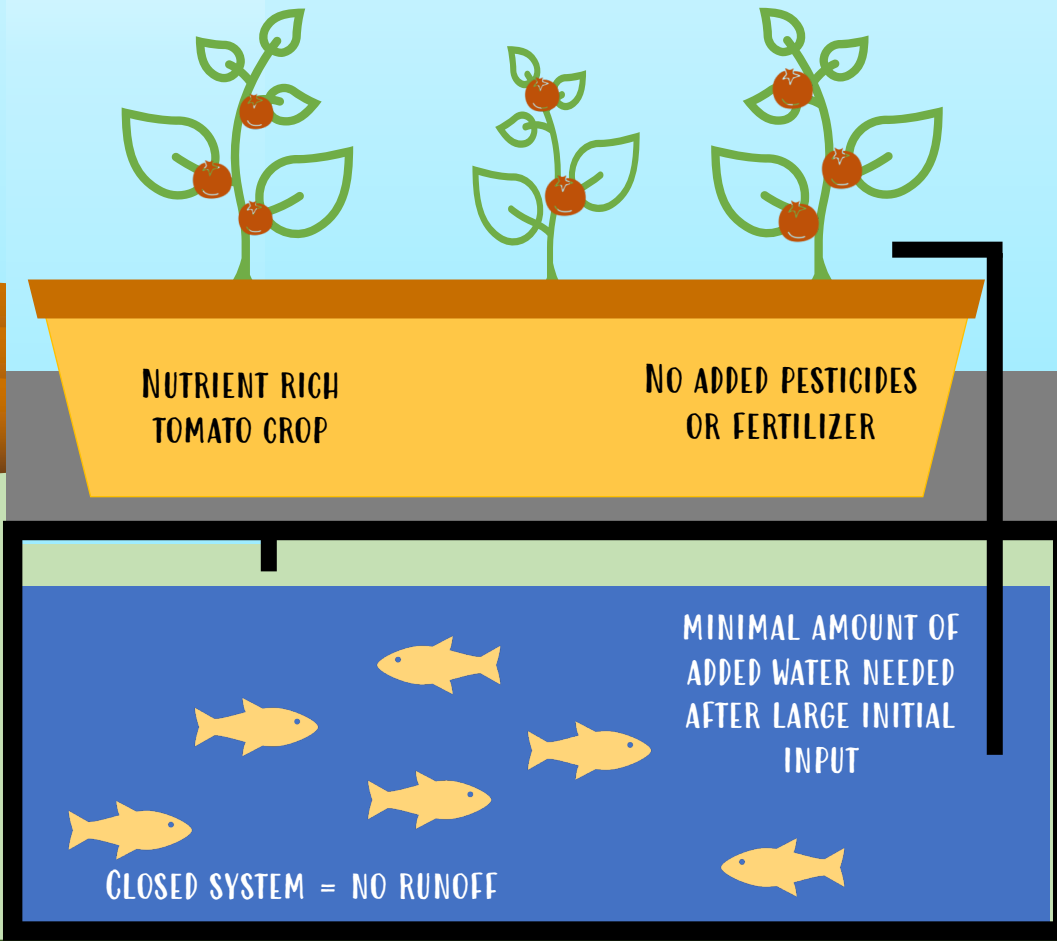
INDUSTRIAL AGRICULTURE

Single-crop industrial tomato agriculture in California uses water **inefficiently and unsustainably**. The sources of inefficiency within an agricultural system are **poor irrigation practices, excess fertilizers used and the application of harmful chemical pesticides**. We will look at these sources through examining data on the gallons of water used per pound tomato yield, the eutrophication potential of nearby bodies of water, and the nitrate contamination of drinking water.



PROPOSED SOLUTION

AQUAPONICS



INDUSTRIAL TOMATO AGRICULTURE IN CALIFORNIA

Annual Tomato Consumption	20.3 lbs/person (US avg.)
Annual Tomato Production (2018)	~ 12.769 million tons, ~ 92% total US tomato production
Common Irrigation Methods	sprinkler + furrow irrigation
Water Use/Tomato Yield	29.77 gallons/lb
Average Yield	avg. 49.8 acres/ton (2019)
N Requirement for Max. Yield	100 - 150 lbs/acre
Nitrogen Fertilizer Application	125 - 250 lbs/acre
Phosphorus (P ₂ O ₅) Application	40 - 120 lbs/acre
Eutrophication* Potential <i>*excessive aquatic vegetative growth due to an increased availability of key nutrients such as nitrogen or phosphorus</i>	~ 3.401E -04 + ~7.13 E -05 PO ₄ equivalents (study of tomato paste & diced tomato production exclusively) (2015)
Nitrate Contamination of Public Wells	10-15% exceed state standards, affecting 680 communities; 21 million people

WHY SHOULD YOU CARE?

Industrial tomato growth contributes to **widespread water scarcity** in California, which **lengthens regional periods of drought**. Irresponsible irrigation is a major mechanism causing pollutants to bleed into surrounding fresh water sources, further **increasing water insecurity** for locals.

SOCIO-ECONOMIC SUSTAINABILITY LENS

INDUSTRIAL TOMATO AGRICULTURE

ECONOMIC	SOCIO-ECONOMIC	SOCIETAL
Struggling local farms Tourism reduction Diminished food autonomy	Diminishing productivity from societal health problems	Lack of equitable water distribution Negative health impacts

AQUAPONIC TOMATO AGRICULTURE

ECONOMIC	SOCIO-ECONOMIC	SOCIETAL
Large upfront investment Long-term profit returns through efficient, self-sustaining system	Educational Tourism = Profit + Community Building	Equitable water access preserved/not impacted No health impacts

WHY AQUAPONICS?

COMPARED TO INDUSTRIAL AGRICULTURE

- Aquaponics uses **90% less water** than industrial agriculture
- There is **no harmful runoff** associated with aquaponics
- Little required energy:** electricity from grow lights, pumps + filtration, where **renewable energy** such as wind, solar, and hydroelectric often used
- Conserves land - growing **6x more per square foot**

COMPARED TO VERTICAL FARMING + PERMACULTURE

- Through an informal **decision matrix analysis**, aquaponics was found to have the **highest Total Suitability Score** through the following metrics:
- Water, land + nutrient use efficiency
 - Water pollution mitigation
 - Cost of implementation
 - Required maintenance
 - Impact on the local economy

NEXT STEPS

