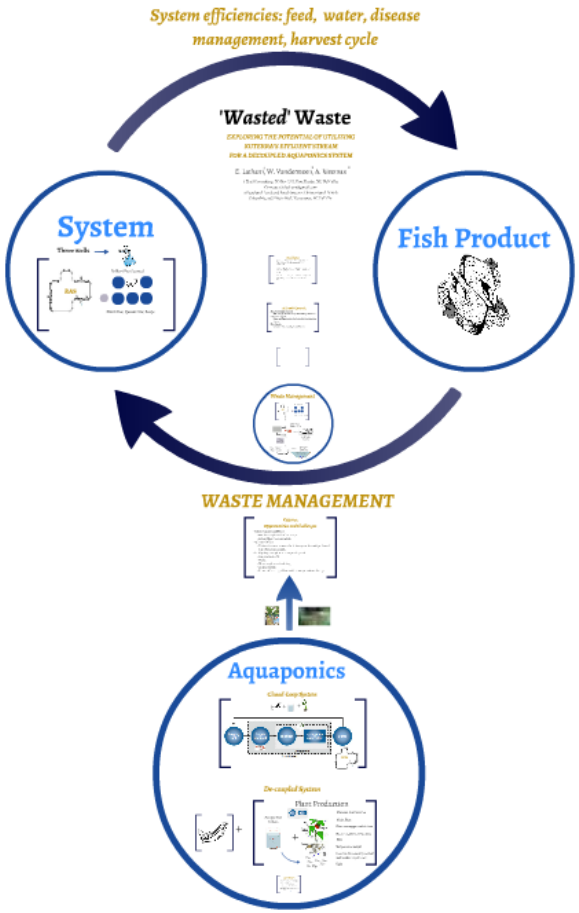
System efficiencies: feed, water, disease management, harvest cycle
'Wasted' Waste
System
Fish Product
WASTE MANAGEMENT
Aquaponics

'Wasted' Waste

EXPLORING THE POTENTIAL OF UTILIZING KUTERRA'S EFFLUENT STREAM FOR A DECOUPLED AQUAPONICS SYSTEM

E. Latham[1], W. Vandersteen[2], A. Riseman[2]

1 Elsel Consulting, PO Box 1777, Port Hardy, BC, V0N 2P0.
Contact: els.latham@gmail.com
2 Faculty of Land and Food Systems, University of British Columbia, 2357 Main Mall, Vancouver, BC V6T 1Z4.

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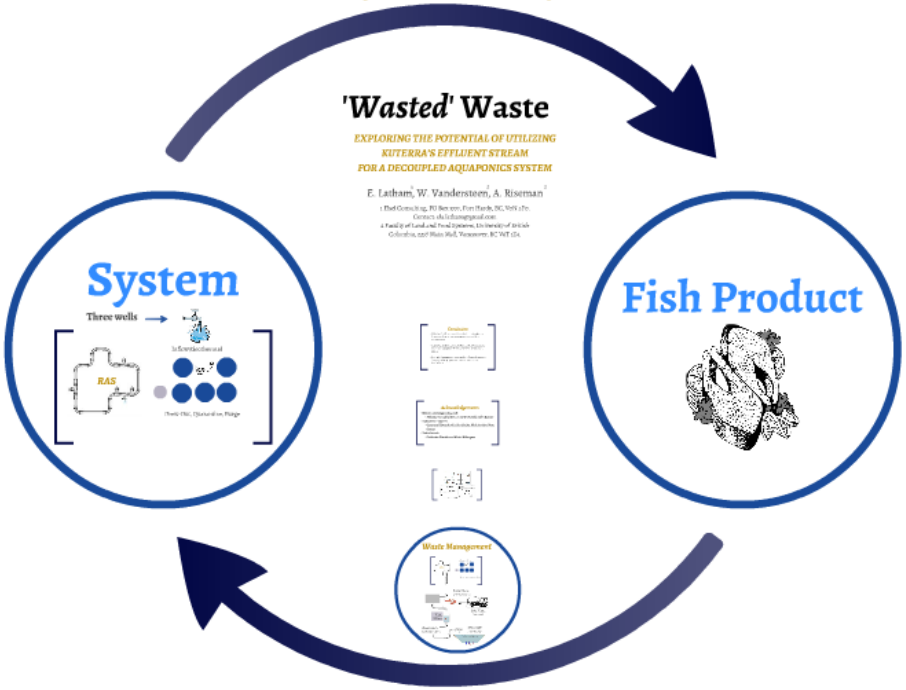
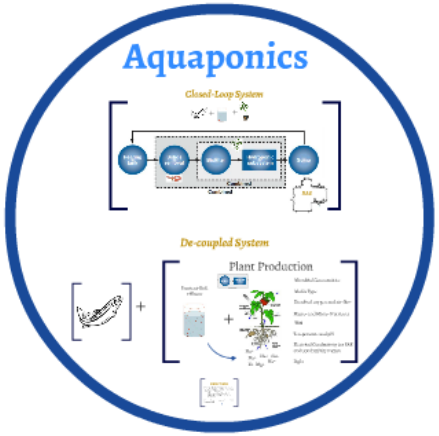


WASTE MANAGEMENT



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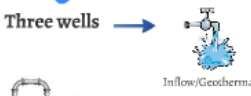
System

Three wells



Inflow/Geothermal

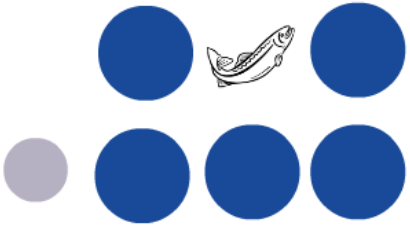
Fish Product

WASTE MANAGEMENT

System

Three wells →

Inflow/Geothermal



Grow-Out, Quarantine, Purge

System efficiencies: feed, water, disease management, harvest cycle

'Wasted' Waste

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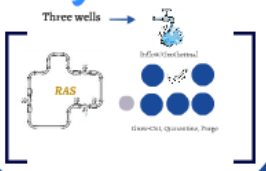
System

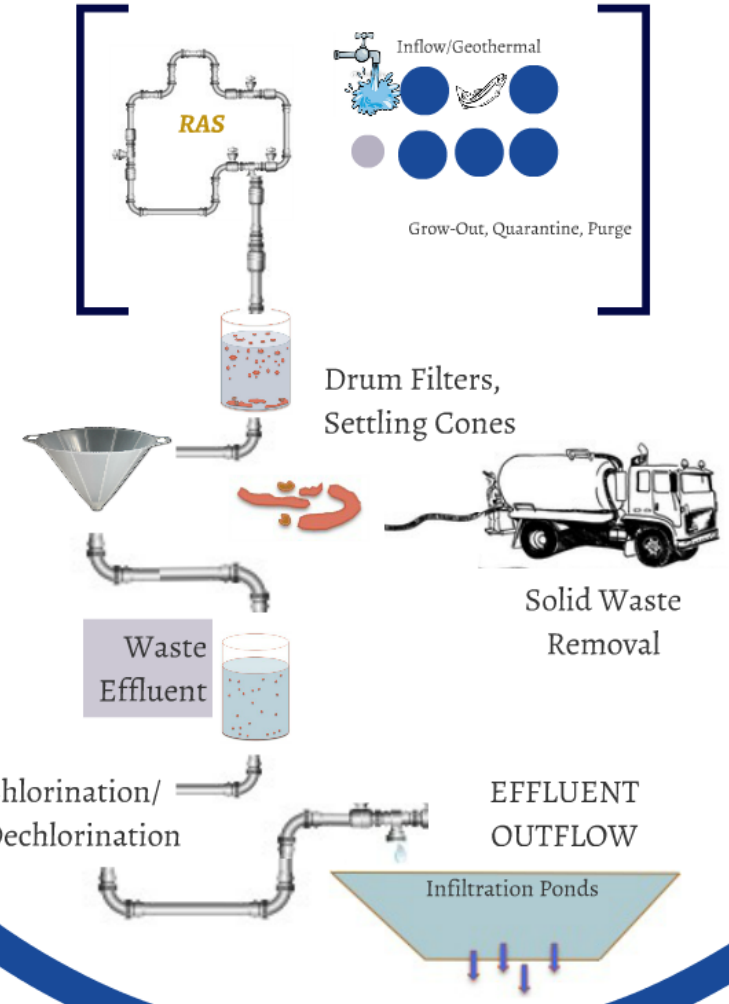


Fish Product

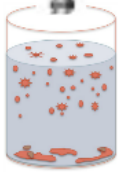
WASTE MANAGEMENT

Aquaponics

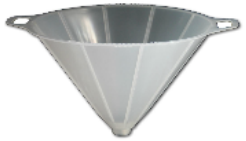
Waste Management



Grow-Out, Quarantine, Purge

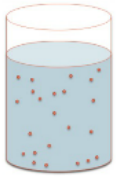


Drum Filters,
Settling Cones



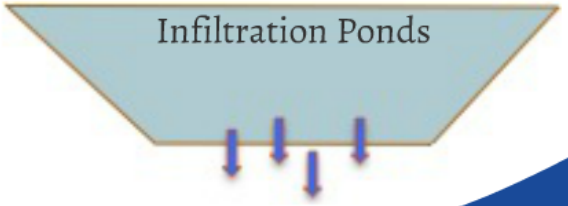
Solid Waste
Removal

Waste
Effluent

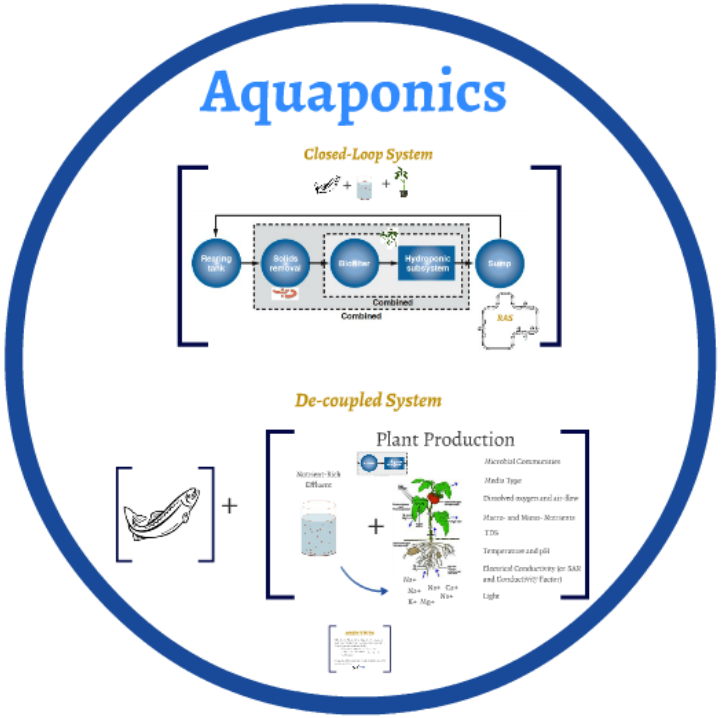


Chlorination/
Dechlorination

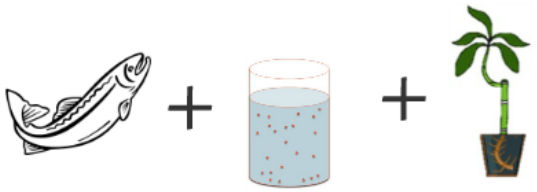
EFFLUENT
OUTFLOW

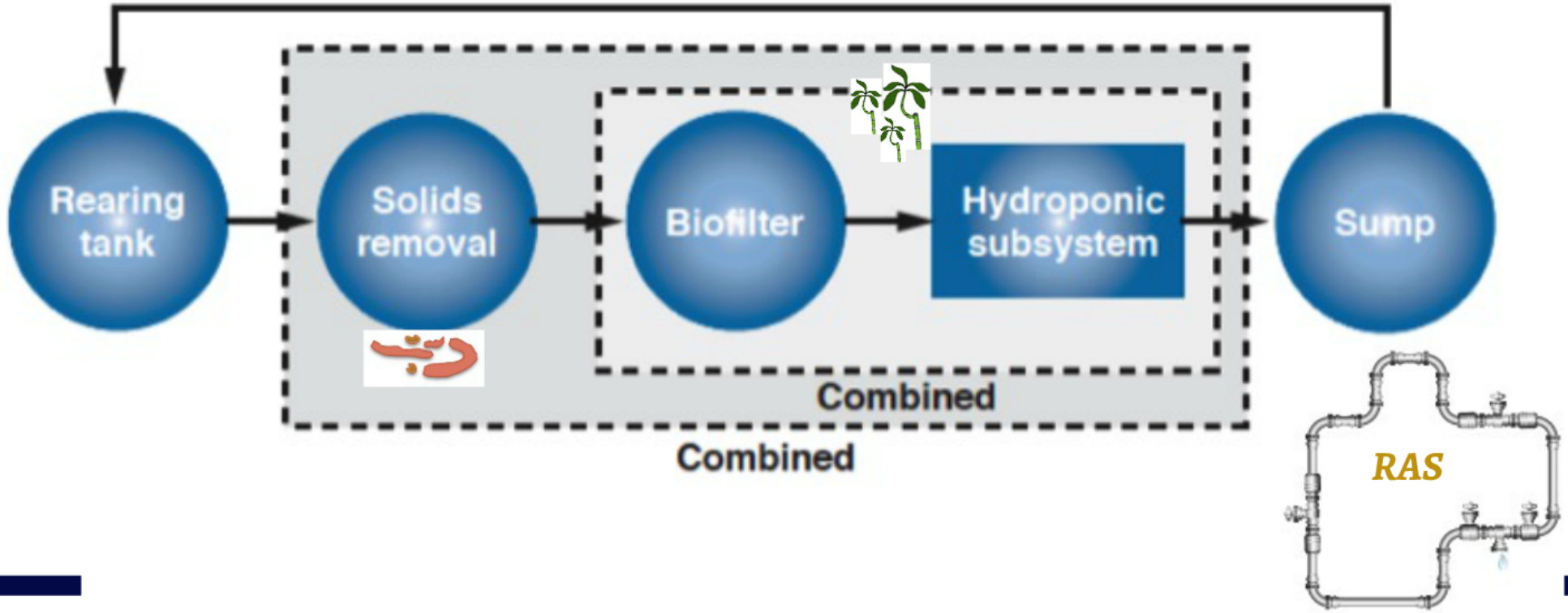


WASTE MANAGEMENT



Closed-Loop System

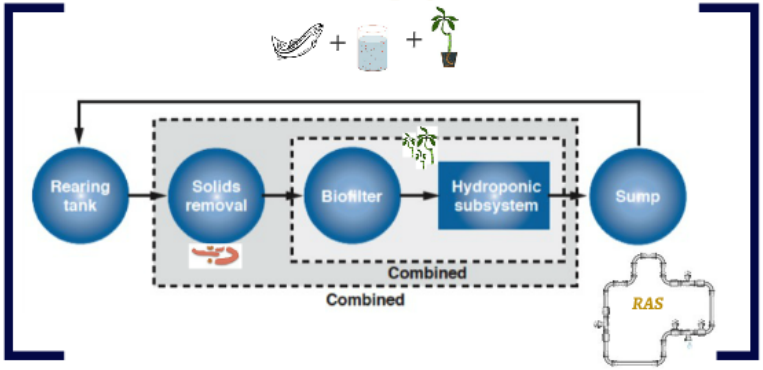




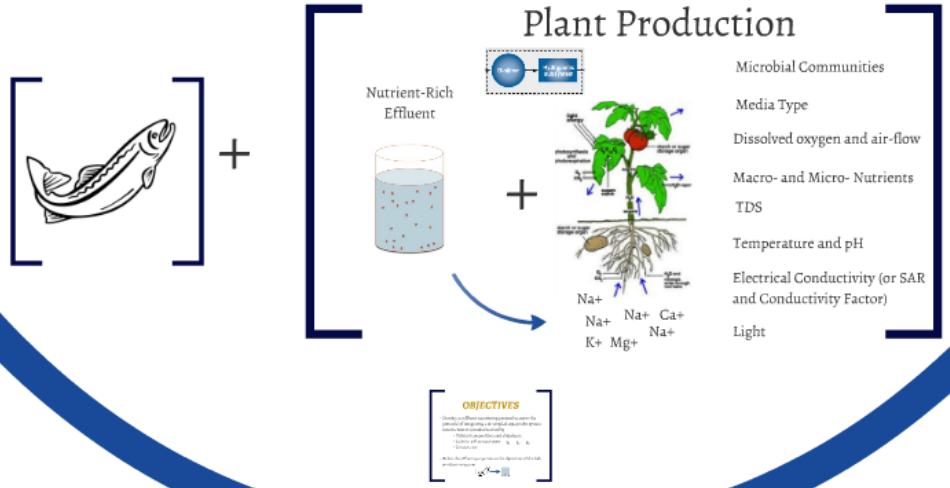
De-coupled System

Aquaponics

Closed-Loop System



De-coupled System

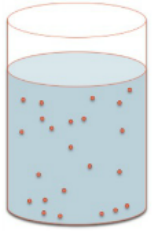


De-coupled System

+

Plant Production

Nutrient-Rich Effluent



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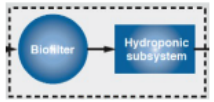
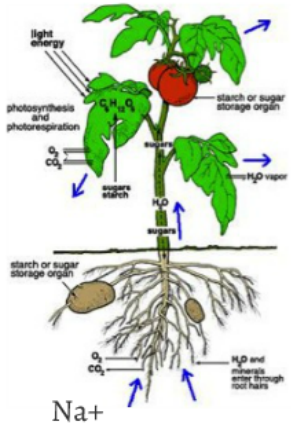
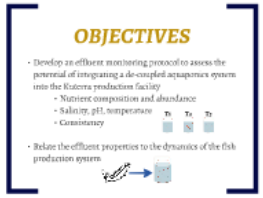


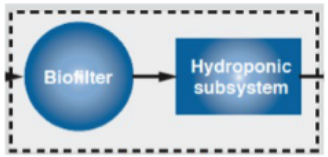


- Microbial Communities
- Media Type
- Dissolved oxygen and air-flow
- Macro- and Micro- Nutrients
- TDS
- Temperature and pH
- Electrical Conductivity (or SAR and Conductivity Factor)
- Light

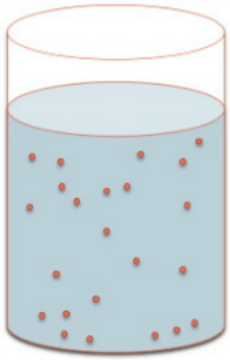


De-coupled System

Plant Production



Nutrient-Rich Effluent



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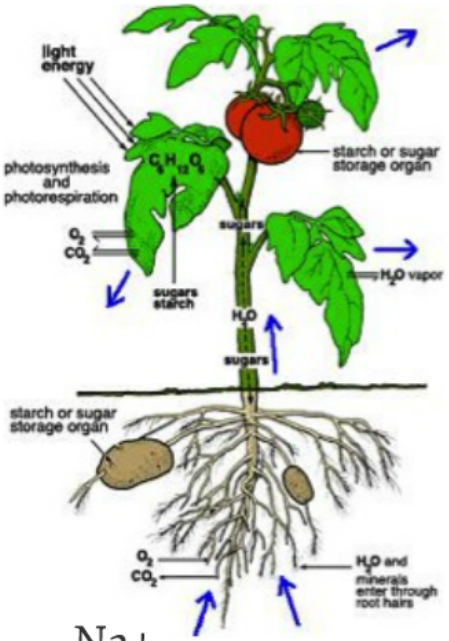


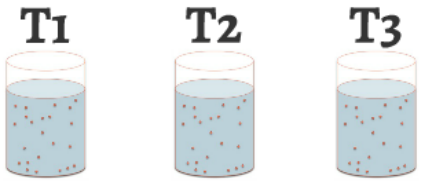
Na+
Na+ Na+ Ca+
Na+
K+ Mg+

- Microbial Communities
- Media Type
- Dissolved oxygen and air-flow
- Macro- and Micro- Nutrients
- TDS
- Temperature and pH
- Electrical Conductivity (or SAR and Conductivity Factor)
- Light

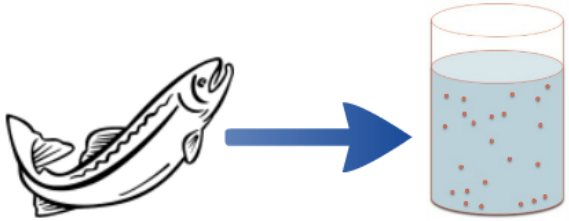
OBJECTIVES

OBJECTIVES

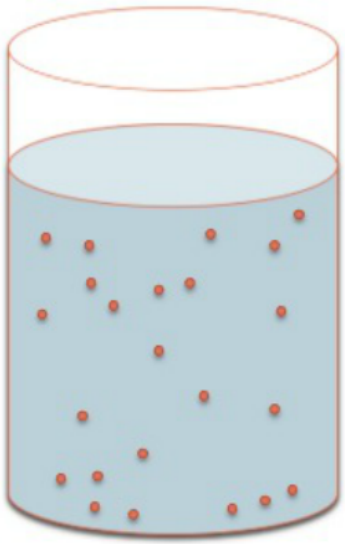
- Develop an effluent monitoring protocol to assess the potential of integrating a de-coupled aquaponics system into the Kuterra production facility
    - Nutrient composition and abundance
    - Salinity, pH, temperature
    - Consistency

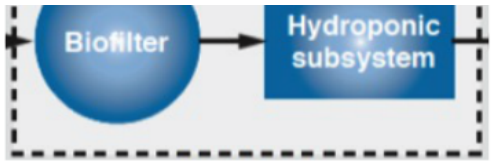


- Relate the effluent properties to the dynamics of the fish production system



Nutrient-Rich Effluent





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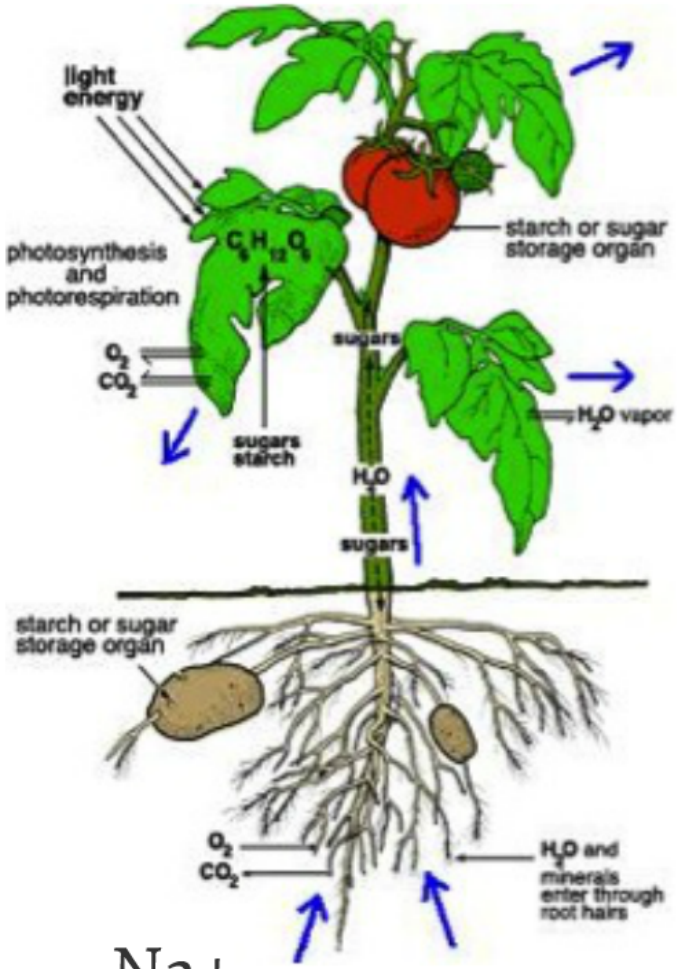


Na+

Na+ Na+ Ca+

Na+

Na+

K+ Mg+

Mi

Me

Dis

Ma

TD

Ter

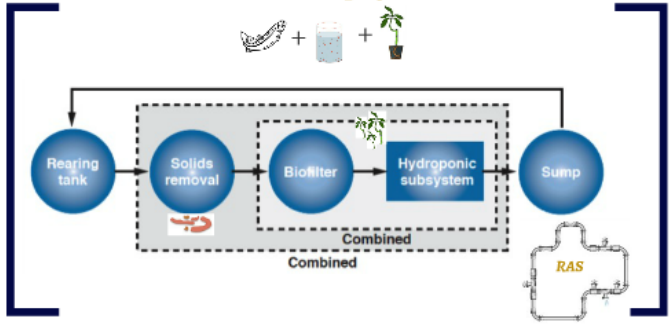
Ele

and

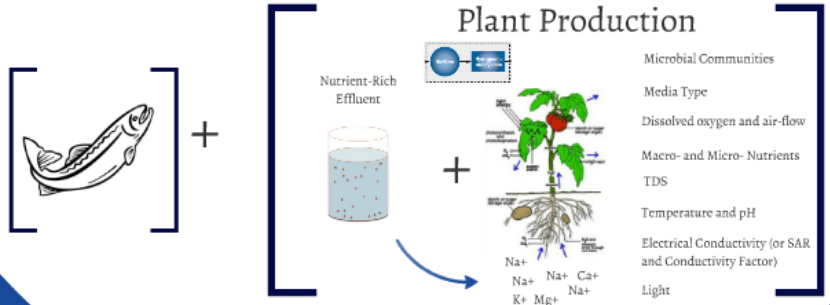
Lig

Aquaponics

Closed-Loop System



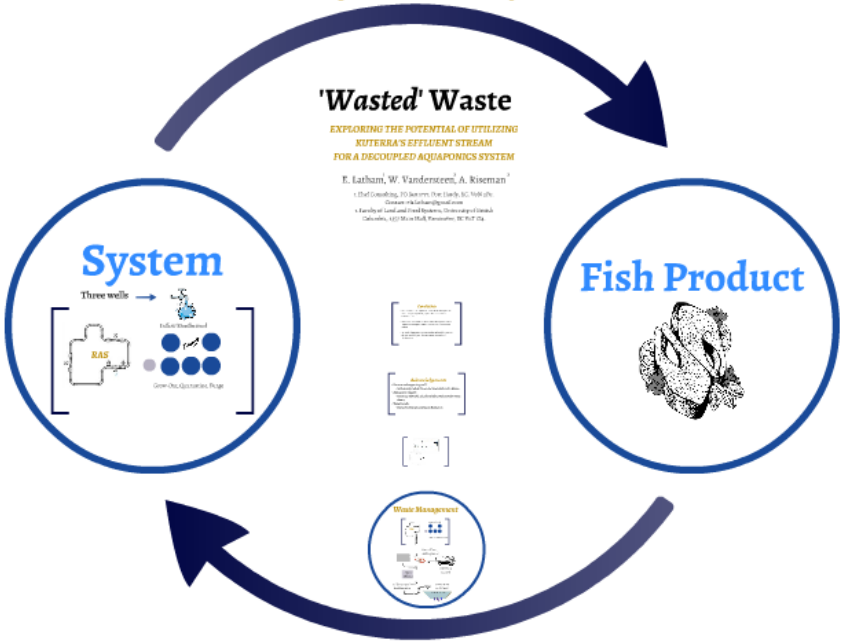
De-coupled System



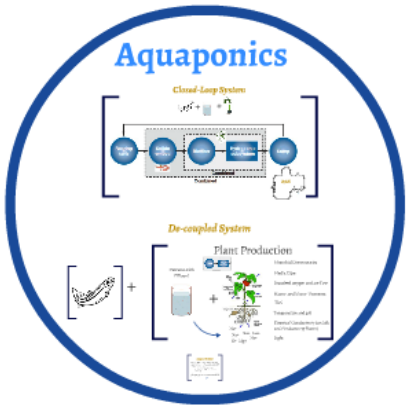
Kuterra:
Opportunities and Challenges

- Where to draw the effluent?
  - Outflow: may be too low in nitrogen
  - Before filters: too many solids
- Salinity of effluent
  - Freshwater source may need to be incorporated to mitigate loss of water from transpiration
- Anticipating a test phase of plant growing trials
  - Greenhouse model
  - Media
  - Flow through or recirculating
  - System controls
  - Future: Off-venting of CO_2 and heat into greenhouse facility

System efficiencies: feed, water, disease management, harvest cycle



WASTE MANAGEMENT



Conclusion

- Modeling the effluent properties is the first testing phase of Kuterra's goals in pursuing aquaponics as an ancillary revenue stream

- Kuterra has ideal system to contribute to the advancement of commercial aquaponics AND the production of sustainable salmon

- De-coupled aquaponics systems and use of brackish water are the vanguard of aquaponics innovation, research and development

'Wasted' Waste

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Centre for Sustainable Food Systems-
UBC Farm
Aquaponics Project: Aquatic Agroecosystem
Mimic nature: Zero waste, designed food web
Only fish food in, only people food out
Andrew Riseman, Academic Director
andrew.riseman@ubc.ca

Parameters	Kuterra Averaged from April-August 2014	Warncke (1983) greenhouse soil-media estimates		Schultz and Rakocy (University of Virgin Islands aquaponics model)
		Acceptable	Optimal	
Effluent volume	920 L/minute	-	-	-
Temperature	13.9˚C	-	-	21-24˚C
pH	7.1	5.0-5.6	5.7-6.5	
Total Nitrogen (ppm)	24.7 ppm	40-99 ppm	100-199 ppm	-
Total Phosphorous (ppm)	1.2 ppm	3-5 ppm	6-10 ppm	-
O2 (ppm)	7.4 ppm	-	-	5 mg/L
Total Dissolved Solids (TDS)	2,300 mg/L	-	-	200-2,000 mg/L
Salinity	2.0 ppt	1.5-2.4 dS/m	2.5-3.4 dS/m	0.3-3.0 dS/m