



Crop-Wash Station: From Drain to Faucet

Rujuta Munshi, Meg Slattery, Lilly Imani

Our Team



Lilly Imani
M.S. Student
Civil Engineering



Rujuta Munshi
B.S. Student
Mechanical Engineering



Meg Slattery
M.S. Student
Energy Systems

Final Project Statement



Evaluate alternative methods to recycle water from a crop wash station while promoting food safety at the New Roots farm in West Sacramento.



Methodology

- ❖ Research
- ❖ Develop design criteria
- ❖ Select five alternatives
- ❖ Process diagrams + SWOT analysis
- ❖ Decision matrix



Research Methodology



- ❖ Site Visits
- ❖ Sector Papers
 - Food safety
 - Sediment Removal
 - UV Purification
- ❖ Water quality testing
- ❖ Prior Art

Background

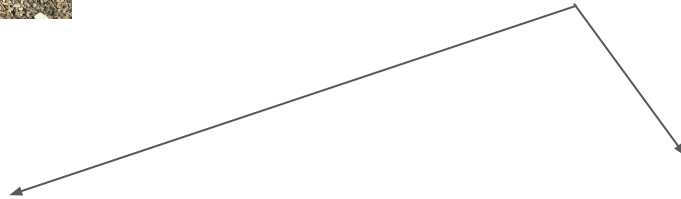
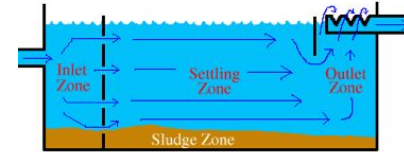
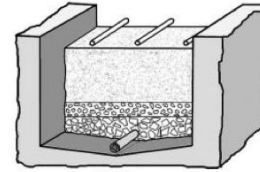
Current Practice Water Disposal



Water Capture Sink and Spray



Sediment Removal Filtration vs. Gravity Settling



UV Purification

- Power
- Low Turbidity (<18 NTU)
- Drinking Water Standard

Irrigation

- Watering Schedule
- Land
- Irrigation Water Standard

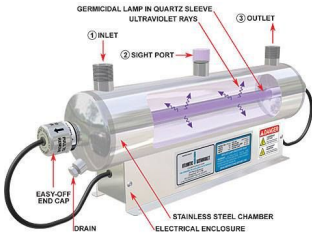
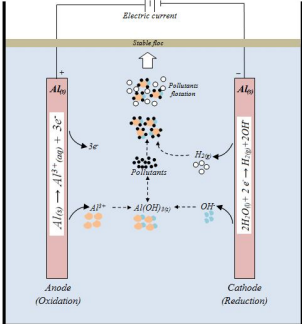
Prior Art

Bag Filters → Activated Carbon Filters → Drip Irrigation



Greenhouse Water Reuse¹

Electrocoagulation → UV Disinfection → Recycled Wash Water



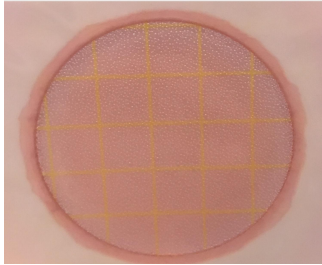
Lettuce Wash Water Treatment²

Water Quality Testing

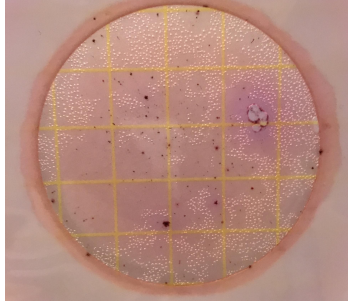
E. Coli

Coliform

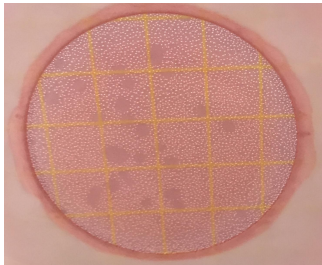
Hose Water



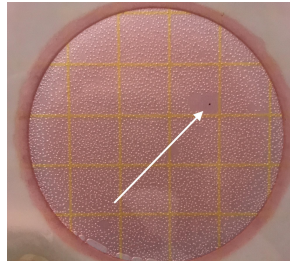
First Spray



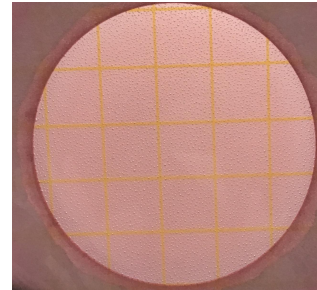
Outlet



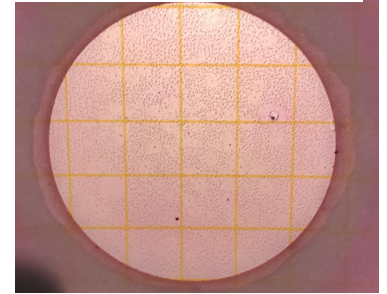
Final Spray



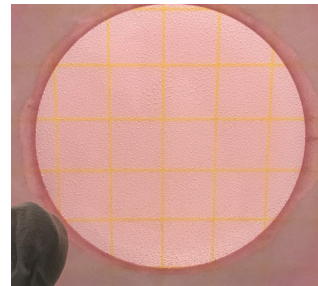
Hose Water



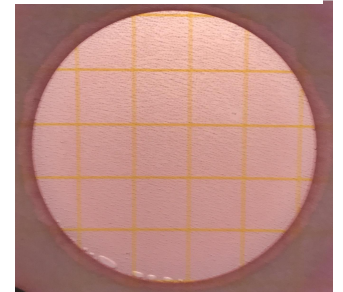
First Spray



Outlet



Final Spray



Design Criteria



Technical

- Ease of use
- Compatible with existing infrastructure
- Uses UV purifier
- Pressure/energy requirements?



Environmental

- Safety (low risk of cross-contamination)
- Reduce water use



Economic

- Minimize Cost
 - Upfront
 - Operation & maintenance
- Added value



Social

- Provides learning opportunity
- Minimal upkeep

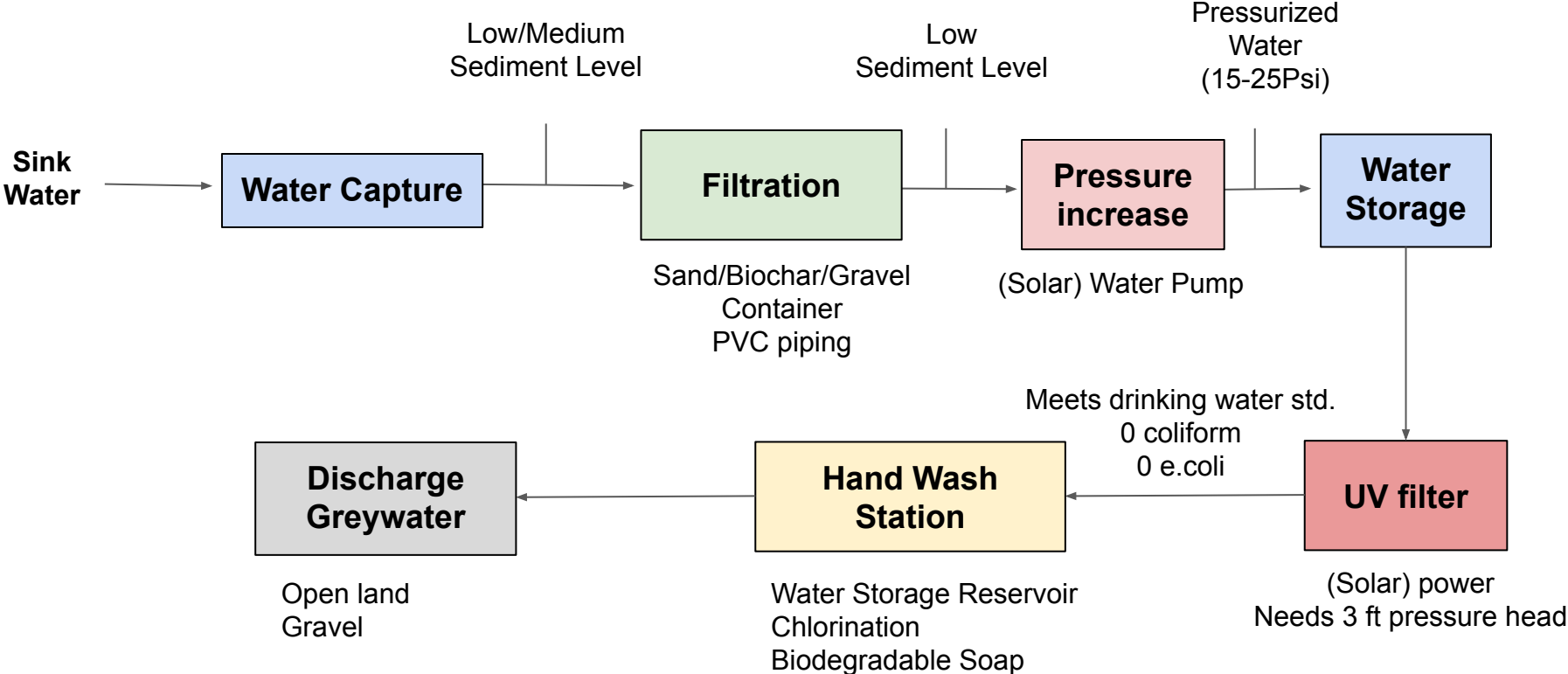
Potential solutions

1. Recycle in crop wash station (closed-loop)
2. Connect to drip irrigation system
3. Connect to furrow-irrigated plot
4. Rain garden
5. Hand-washing station



Process Diagram Example:

Hand Wash Station



SWOT Analysis Example: Hand Wash Station

Strengths	Weaknesses
<p>Incorporates UV filter</p> <p>18 NTU is an easy to reach turbidity level</p> <p>Repurposes greywater</p>	<p>High filtration required</p> <p>Requires solar pumps</p> <p>Requires biodegradable products</p>
Opportunities	Threats
<p>Develop a curriculum based on waterborne bacteria and its impact on health</p> <p>Can provide improved sanitation</p>	<p>Maintenance is critical to system</p> <p>Human health risk if not used properly (unchlorinated water is accidentally ingested)</p>

Results: Decision Matrix

Option	Safety		Ease of use		Cost to Implement		Learning Opportunity		Value added		Ease of installation		Total
Dispose directly*	5	5	5	3	5	4	0	3	0	3	5	3	75
Crop wash	3	5	3	3	2	4	5	3	5	3	2	3	68
Drip Irrigation*	4	5	3	3	2	4	3	3	5	3	1	3	64
Furrow Irrigation*	4	5	3	3	3	4	4	3	4	3	3	3	74
Rain garden*	5	5	5	3	4	4	3	3	2	3	4	3	83
Hand wash	3	5	3	3	3	4	5	3	4	3	3	3	72

*Does not use UV purifier



- Work with client to determine final design and follow information on the flow charts to prototype a solution.
- Incorporate food safety curriculum.



Questions?

