Crop-Wash Station: From Drain to Faucet

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Our Team

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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

Electrocoagulation → UV Disinfection → Recycled Wash Water

Greenhouse Water Reuse

Lettuce Wash Water Treatment
Water Quality Testing

E. Coli

Hose Water
First Spray
Outlet
Final Spray

Coliform

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

Sink Water

Water Capture

Low/Medium Sediment Level

Filtration

Low Sediment Level

Pressure increase

Pressurized Water (15-25Psi)

Water Storage

(Solar) Water Pump

Sand/Biochar/Gravel Container
PVC piping

Meets drinking water std.
0 coliform
0 e.coli

Discharge Greywater

Open land Gravel

Hand Wash Station

Water Storage Reservoir
Chlorination
Biodegradable Soap

UV filter

(Solar) power
Needs 3 ft pressure head
## SWOT Analysis Example: Hand Wash Station

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Incorporates UV filter</td>
<td>High filtration required</td>
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<tr>
<td>18 NTU is an easy to reach turbidity level</td>
<td>Requires solar pumps</td>
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<tr>
<td>Repurposes greywater</td>
<td>Requires biodegradable products</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
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</thead>
<tbody>
<tr>
<td>Develop a curriculum based on waterborne bacteria and its impact on health</td>
<td>Maintenance is critical to system</td>
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<tr>
<td>Can provide improved sanitation</td>
<td>Human health risk if not used properly (unchlorinated water is accidentally ingested)</td>
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</tbody>
</table>
## Results: Decision Matrix

<table>
<thead>
<tr>
<th>Option</th>
<th>Safety</th>
<th>Ease of use</th>
<th>Cost to Implement</th>
<th>Learning Opportunity</th>
<th>Value added</th>
<th>Ease of installation</th>
<th>Total</th>
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<tbody>
<tr>
<td>Dispose directly</td>
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<td>4</td>
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<td>Drip Irrigation*</td>
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<td>Rain garden*</td>
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*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?