Water Supply in Rural Dominican Republic

Closed-Loop Treatment System at El Desecho

PURDUE UNIVERSITY

OVERVIEW

Our team travelled to the Dominican Republic in May 2025. During this trip, the team evaluated and maintained the existing water supply and treatment systems at local schools in **El Desecho, El Mamey, and Las Canas**. Evaluation included water quality testing in collaboration with Instituto Superior de Agricultura (ISA), a local university, and maintenance entailed the replacement of system components. We also engaged in water education activites at local schools. Our group has been analyzing the collected water quality data to determine opportunities for design improvement for **May 2026**.

La Vega Region, Dominican Republic

Public Health

Justification

- Dominican Republic is ranked the **100th** country in **access to safe drinking water** (Water Action Hub).
- **443 million school days** are lost each year globally due to **water-related illnesses** (Wells for the World Inc).
- **Bacteria and aerobes** found in water can cause **extreme health effects** such as gastrointestinal infections.

Sampling Methods

Universidad ISA Lab

Our team took samples to Universidad ISA in May 2025 and tested 5 different parameters, measured by units of Most Probable Number (MPN) and Colony-forming unit (CFU)

- Mesophilic Aerobes
- Pseudomona aeruginosa
- Total Coliforms

Compartment Bag Testing

- Indicates viable microorganisms in a water sample by color chart measuring Most Probable Number (MPN)
- Lower MPN indicates cleaner water, ideal value is 0

Water Quality Data

Table 1. *Compartment Bag Test Results (2025)*

Water Source	UV Light MPN	High Risk Category
Purdue Treatment System	>100	Unsafe
Handwash, untreated	>100	Unsafe
Well water, untreated	>100	Unsafe

Table 2. *Universidad ISA Parameter Testing (2025)*

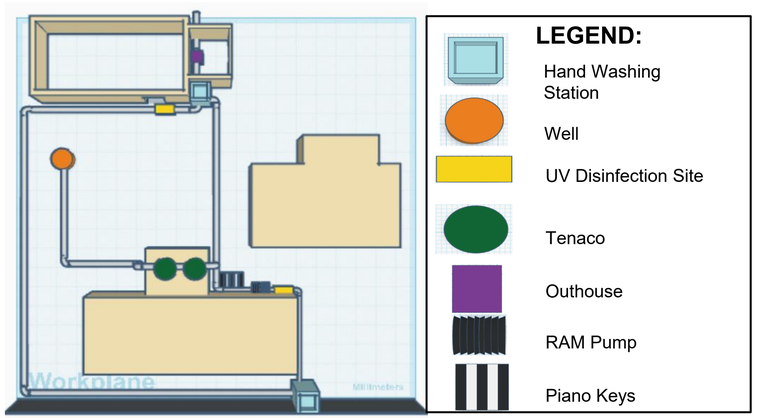
Parameter	Value	Unit	United States Maximum Contaminant Level
Mesophyllic Aerobes	1.50E+05	CFU/mL	-
Pseudomonas aeruginosa	>1600	MPN/100 mL	-
Total Coliforms	79	MPN/100 mL	0 or <5% of positive samples taken in a month

Engineering Design

Decision Matrix for Community Design Implementation

	Water Quality	Willingness of Stakeholders	Ease of Transport	Ease of Implementation	Maintenance Feasibility	State of System	Usable Assets	Education Willingness	Final Weight
Weight	2.00	2.00	1.50	2.00	1.00	1.20	1.20	1.50	
El Mamey	4	5	8	4	7	7	9	8	**76.2**
El Desecho	9	9	3	7	5	5	9	9	**89.8**
Las Canas	7	5	8	2	7	3	5	8	**68.6**

Closed-Loop Design Model



The system in El Desecho that is currently implemented fails in the dry season because it is not being used continuously, becoming subject to bacteria and algal blooms when the water is left motionless for months at a time. Thus, the team plans to switch to a closed loop system set to the minimum possible flow so the system is always primed and running. Since a RAM pump operates based on the properties of water only through a combination of open and closed valves, the piano keys will be used to pressurize the system. These keys will be built with sturdy pieces of wood that are angled in a way that an air bladder can fit underneath, connect to a pipe, and push air into the system when the key is stepped on. The flow will be clockwise in relation to the diagram above. The system will also be equipt with a pressure relief valve, an emergency shutdown, and multiple other fittings that are not pictured. The system will be installed in May 2026.

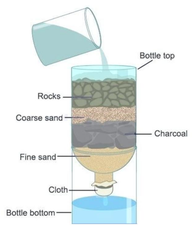
Education

Water Quality and Schools

School enrollment rates **increase 15%** in communities who gain more reliable **access to clean water** (Wells for the World Inc.)

Current Activities

Create-Your Own Filter



Educational Goal:
Creating custom water filter to learn importance of water filtration

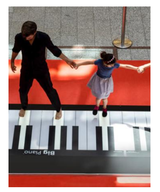
Research Objective:
Post-Activity survey of what students learned observing differences between clean and dirty water

Water Cycle in a Bag

Educational Goal:
Increase understanding of movement of water through the environment

Research Objective:
Educate children on water cycle to build understanding of water systems

Interactive Keyboard Pump



Educational Goal:
Interactive engineering system to display function of a pump

Research Objective:
Observe average usage of system before and after installation

Glo-Germ

Educational Goal:
Display importance of handwashing and germ removal from hands

Research Objective:
Observe effectiveness of handwashing before and after installation of new design