

Combating Undernutrition in Developing Countries with a Compact Aeroponics System Utilizing Contaminated Water

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12% of the global population is impacted by undernutrition, the number one risk to health worldwide, affecting one in three children in developing countries. Fresh produce has large nutritional benefits that could help suffering individuals, but in many cases is unattainable due to a lack of sufficient resources. The objective of this project is to develop a self-powered system that enables the use of contaminated water to grow fresh produce in a highly efficient aeroponics system accessible to families in these countries. Aeroponics is the process of growing plants without a growth medium. Plant roots hang in the air and are periodically misted with a nutrient-rich spray. Saltwater or murky water will be distilled using a solar distillation box. The decontaminated water will then be infused with growth nutrients from a compost tea and used as the nutrient spray in a solar-powered aeroponics system. The feasibility of this idea was tested in a full-scale model. The angle of depression and the water depth were manipulated to determine the ideal set-up for the solar distillation box giving a final output of 34.5mL per hour. Compost infused water was tested for the main growth components; Nitrogen, Phosphate, and Potassium. Cold brewing for 72 hours provided enough nutrients to support plant development. Plant growth was optimized by varying spray times. Most components are accessible to individuals living in Africa. A one-time shipment of basic materials from an aid organization totaling approximately \$19.00 will provide a family with fresh food for years to come.

Awards Won:

Air Force Research Laboratory on behalf of the United States Air Force: First Award of \$750 in each Intel ISEF Category
Third Award of \$1,000