Sustainable Subsistence: A Low-Cost Method of Greywater Recycling for Hydroponic Agriculture

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This project investigates a novel, low-cost method of greywater recycling that promotes hydroponic subsistence agriculture for water-scarce communities. Currently, the world faces both natural and economic water scarcity–a problem that exacerbates resource poverty and high levels of food insecurity, especially in low-income populations. The project's first aim was to investigate the ability of organic materials to filter greywater. Against the control variable of tap water (pH 6.2), different greywater solutions were filtered out by four different units of natural materials (sand, rocks, etc.). Through an analysis of initial and filtered pH levels, it was determined that every tested filter is effective at returning pH to tap-water values. The project's second aim was to determine if the "Kratky Method" of hydroponics is effective for the promotion of family-based, subsistence agriculture. 2" cuts of lettuce were tested for performance against solutions of NaCl, C17H35COO, and 15-30-15 fertilizer. Standard H2O served as the control. A time-based visual analysis suggested that while fertilizer is the most effective in the long term, small concentrations of soap or salt do not significantly impact lettuce health. Considering these tests, a system was designed that integrated organic filtering and hydroponic dispersion. With bulk materials, the system could be assembled for less than $7USD and can produce an estimated 120 lettuce plants per year. However, more testing is needed to determine other plants' performance and to optimize the system's dimensions for a smaller space. Regardless, it is a promising step in the field of sustainable agriculture.

Awards Won:
Fourth Award of $500
United States Environmental Protection Agency: Honorable Mention (DO NOT READ: This finalist will receive mentoring with an EPA researcher with expertise relevant to their project.)