Term UROP is offered: Fall 2021
UROP Department, Lab or Center: D-Lab
MIT Faculty Supervisor Name: Eric Verploegen

Project Title: Modeling of Heat and Mass Transfer of Evaporative Cooling Devices for Improved Vegetable Storage in Low-Income Rural Communities

Project Description: We are looking for a student to continue the development of a heat and mass transfer model of low-cost evaporative cooling devices for improving vegetable storage in Africa and India. When affordable and effective post-harvest storage solutions are not available or affordable, people living in off-grid rural communities will often experience vegetable spoilage, loss of income, lack of access to nutritious foods, and large amounts of time spent purchasing vegetables. Evaporative cooling devices have the potential to provide a low-cost, local available, and effective solution for improving vegetable shelf life.

The goal of the model is to identify how specific design variations impact the performance of the evaporative cooling devices and enable organizations that produce and promote these technologies to optimize designs for maximum performance and minimum cost. This project will build on past work from our research group and the student filling this position will collaborate with other undergraduate students, graduate students, and D-Lab staff. The combined heat and mass transfer model will be refined and validated with experimental data that has been previously collected in Mali, Kenya, and at MIT.

The work can be done entirely remotely, but there is also the opportunity to work with D-Lab researchers to conduct experiments on campus to investigate new design ideas based on insights gained from the modeling. The project will have potential follow-on travel opportunities in (Uganda, Kenya, or India) to test viable prototypes in the field, as well as to continue on the project for multiple semesters.

Interested candidates should email ericv@mit.edu with a brief explanation of why they are interested in this project and describe any relevant previous experience.

Prerequisites: Applicants should have an interest in practical solutions to global poverty challenges. A background in thermodynamics and heat transfer, and experience using either Matlab or computational fluid dynamics (CFD) is required. Experience with heat transfer modeling is preferred. Students that have taken 2.051, 10.302, or a comparable course will have the relevant background.

This a paid UROP opportunity with an expectation that the student will spend between 80-140 hours on the project over the course of the semester.

Relevant URL:
https://d-lab.mit.edu/research/food/evaporative-cooling-vegetable-preservation/performance-and-design-research

Contact: Eric Verploegen (ericv@mit.edu)