

PROPOSAL NARRATIVE

I. Abstract

Engineers Without Borders-Cal Poly's Malawi Program aims to improve the quality of life for individuals in the partner community of Kumponda through the building of a human-powered mechanical maize mill. A diverse team of students came together to support the community-driven development project that entails research, assessment, and implementation--all the while being active global citizens. The team carried out an exploratory assessment trip in December 2013 to learn and prioritize community needs. The team is in need of one more assessment trip that will determine the feasibility of the project under analyzed conditions. This trip is planned for December 2014, in which vital data will be collected and multiple locations will be scouted. The team's budget asks for travel funding, however, by collecting vital information on the next trip abroad, the project will be able to successfully move forward.

II. Introduction

Engineers Without Borders Cal Poly launched the Malawi Program (EWB Malawi) in January 2013. EWB Malawi currently has thirty active student members from sixteen different majors, representing all six colleges on campus. By collaborating with a non-governmental organization, Action for Environmental Sustainability (AFES), the group seeks to improve the quality of life for Kumponda residents through educational partnership and engineered solutions. An initial assessment trip to Kumponda in December 2013 revealed that food security is the most severe and pressing issue in the community. To address this need, with the support of the Spring 2014 Warren J. Baker Endowment Request for Proposals, EWB Malawi proposes a project entitled "Human-Powered Mechanical Maize Mill."

The Malawian diet relies on a cornmeal staple called *nsima*; however, agricultural commitment to maize has depleted soil nutrients and made all of Kumponda vulnerable to drastic

food shortages due to fluctuating growing conditions. In addition to their dependence on a monoculture system, the lack of economic opportunity creates an inability to purchase food in times of subsistence farming lows. The current growing period which is heavily dependent on rainfall provides food for approximately three to six months. Once those supplies are depleted, community members must purchase maize from the market, but more often than not cannot afford enough for the rest of the year, leading to periods of sustained hunger.

Kumpondans currently have two options for preparing the fine corn flour necessary to make *nsima*: by hand (using a mortar and pestle) or through a privatized electric maize mill. The sole maize mill in Kumponda is located upwards of 15 kilometers from a majority of Kumponda's sub-villages, a trip which must be made on foot while carrying 20 kilograms of corn. When community members are finally able to reach the mill, they are charged substantial fees for its use. As one would imagine, the hand technique is cumbersome and time consuming, while the obstacles of the singular maize mill, which is meant to serve the 5,000 person community, is not a tenable option. EWB Malawi's goal is to bridge this gap in technologies by creating a mechanical maize mill which can be inexpensively and simply replicated by the community. Although this technology does not directly address the root of the community's food insecurity, namely agricultural inefficiency, there is potential to create economic opportunity.

As a team, EWB Malawi decided to design a project addressing the inefficiency of Kumponda's agricultural system for several reasons. Irrigation, after much team deliberation is now considered unfeasible. Firstly, the community is distant from any reliable water sources. Secondly, a massive infrastructural irrigation system would not be sustainable under Kumponda's monetary state. The team decided that the best way to reach out to the highest number of community members would be through the building of a mechanical maize mill, which will give community members a highly efficient and inexpensive tool to grind their corn.

A mechanical maize mill will not only streamline the production of food but also provide more economic opportunities. The advantages would include operation of the mill by community

members and the development of new job opportunities, while also providing cheaper and quicker options to turn maize into flour. The efficiency of the maize mill will provide further options for community members to focus on planting, irrigation, or production of market items such as bananas, pineapples, mangoes, tomatoes, and peanuts.

EWB will be partnering with the community for 5-10 years to ensure community ownership and successful knowledge transfer to reproduce and maintain the mill. Not only is the team dedicating time, but the community members are required by EWB protocol to dispense 5% of project costs in either money or work. Both sides of this partnership are investing limited resources to ensure that the project is successful and both sides mutually benefit.

III. Objective(s)

- (1) Travel to Kumponda in December 2014 to assess available materials that may be used by the community to replicate the maize mill and conduct analysis of cost constraints.
- (2) Collect data from trial runs of a maize mill prototype to analyze effectiveness and gain community insights to apply to a final, implementation ready iteration of the mill.
- (3) Create a dissemination schedule with community leaders to establish next steps towards implementation using mapping technology and economic development principles.
- (4) Develop workshops to enhance understanding of the mill's technical operation and construction, and create assisting, easy-to-understand repair manuals.
- (5) Research the integration of permaculture practices to increase agricultural efficiency, while preserving Malawian tradition and culture, to overlap the increased economic viability from the maize mill.

IV. Methodology

Use of EWB USA's Planning Monitoring Evaluation and Learning (PMEL) Program, allows for the successful implementation of projects in partnering countries. These guidelines will be used in reference for the achievement of the team's objectives. The first step in EWB's methodology is careful planning, and considering this is the team's flagship project. The use of

the assessment trip provides immeasurable information on what exactly is needed in Kumponda. The community clearly indicated that food security remains the biggest single issue, therefore all of the team's planning has centered on this issue. In coordination with planning, the team has separated into groups of 8-10 students to come up with strategies to help with this issue. These groups have allowed students to practice skills such as design, cost estimating, building, industrial output, material working, business models to name a few, while still applying cultural constraints. As soon as the design is chosen, the plan is to prototype. Prototyping will be based off of information provided from both past and future assessment trips, such as what materials to use, costs, community opinion, and expected flour outputs. Final designs will be concluded by Winter Quarter 2015 in preparation for implementation in Summer 2015.

To ensure sustainability, future monitoring trips as well as regular Skype calls with AFES provide earnest progress reports. Accompanying the actual project will be troubleshooting pamphlets designed by students in case of breakdowns and for safety of operation. Community input is held in high regard for any EWB project, and this will be collected by students during future trips to Malawi.

These future trips to Malawi will allow the team to evaluate the success of the mechanical maize mill. The team will be able to understand the outreach and the influence the mill has provided in the community. Only with positive feedback can this project be considered successful and implemented further to help the community. One of the major strengths of the EWB-USA PMEL Program is the learning aspect. EWB is a platform to learn from past mistakes which is often considering the large amounts of hands on work. The team can learn from the mistakes of the project and better designs for future use and future students. Considering the size of the club and the interdisciplinary nature of EWB, this project has a global impact. Corn has and will remain a global food staple, so this project, the first of its kind at Cal Poly can be further worked on and reproduced in other countries.

V. Timeline

Date	Task
April 2014	EWB 501B New Project Within Existing Program Report Submitted
May 2014	Informal Preliminary Prototyping of Maize Mill
July 2014	EWB 521 Pre-Assessment and EWB 600 Health & Safety Plan Submitted
November 2014	Final Preliminary Maize Mill Prototype Finished & Ready
December 2014	Travel to Malawi - Secondary Assessment
January 2015	EWB 522 Post-Assessment Report Submitted
February 2015	EWB 523 Alternative Analysis Report Submitted
March 2015	EWB 524 Final Design Report Submitted
April 2015	EWB 525 Pre-Implementation and EWB 600 Health & Safety Plan Submitted
August 2015	Travel to Malawi - Implementation
September 2015	Warren J. Baker Endowment Final Report Submitted

VI. Final Products and Dissemination

The final product of the mechanical maize mill will be implemented in-country and easily reproduced by community members of Kumponda. The original prototype will be showcased on behalf of the Malawi Team at events EWB-Cal Poly partakes in such as Club Showcase, Winter Showcase, Open House, Cal Poly's SPECTACTLE, Earth Day Sustainability Fair, and SLO Mini Maker Faire, and EWB conferences. Presentations will be held with a variety of Cal Poly departments, Rotary International Clubs, corporate partners. For the 2014-2015 school year, the team's goal is to get project efforts showcased in Cal Poly Magazine and department newsletters.

VII. Budget Justification

The assessment trip scheduled for December 2014 will be comprised of four students, one required faculty adviser, and one required professional mentor. Warren J. Baker Endowment funds will go towards supporting airfare (\$2,100 per person, \$12,600 total), in-country travel expenses (\$200), Cal Poly travel insurance (\$300), food/water (\$1,000), and lodging (\$900).

PROPOSAL BUDGET

Student Applicant(s): Gabrielle Amar Kerry McCormick Alice Zanmiller	
Faculty Advisor: Rebekah Oulton	
Project Title: EWB Malawi – Human-Powered Mechanical Maize Mill	Requested Baker Endowment Funding
Travel <i>subtotal</i>	\$ 4,000.00
Travel: In-state	\$ 0
Travel: Out-of-state	\$ 0
Travel: International	\$ 4,000.00
Operating Expenses <i>subtotal</i>	\$ 0
Non-computer Supplies & Materials	\$ 0
Computer Supplies & Materials	\$ 0
Software/Software Licenses	\$ 0
Printing/Duplication	\$ 0
Postage/Shipping	\$ 0
Registration	\$ 0
Membership Dues & Subscriptions	\$ 0
Multimedia Services	\$ 0
Advertising	\$ 0
Journal Publication Costs	\$ 0
Contractual Services <i>subtotal</i>	\$0
Contracted Services	\$ 0
Equipment Rental/Lease Agreements	\$ 0
Service/Maintenance Agreements	\$ 0
TOTAL	\$ 4,000.00