

Warren J. Baker Endowment

for Excellence in Project-Based Learning

Robert D. Koob Endowment for Student Success

FINAL REPORT

Final reports will be published on the Cal Poly Digital Commons website (<http://digitalcommons.calpoly.edu>).

I. **Project Title:** EWB Malawi Human- Powered Mechanical Maize Mill

II. **Project Completion Date** August 2016 (Completion of Implementation)

III. **Student(s), Department(s), and Major(s)**

(1) Spencer Jemes, Project Manager, Civil/ Environmental Department, Civil Engineering

(2) Jennifer Tuttle, Project Manager, Civil/ Environmental Department, Civil Engineering

(3) Sydney Poyd, Project Manager, Civil/ Environmental Department, Civil Engineering

Our team is comprised of around 30 other students in the Colleges of Engineering, Liberal Arts, and Business.

IV. **Faculty Advisor and Department**

Jane Lehr, Women's and Gender Studies, College of Liberal Arts

V. **Cooperating Industry, Agency, Non-Profit, or University Organization(s)**

Engineers Without Borders - Cal Poly San Luis Obispo - Malawi Team

VI. **Executive Summary**

Our Engineers Without Borders, Malawi Team at Cal Poly San Luis Obispo, began cooperation with Kumponda in December 2013. The team found food security to be the greatest challenge faced by the community due to severe droughts. The Human-Powered Maize Mill will address this issue by allowing community members to grind their maize independently rather than depending on the unreliable electric maize mill. This will then reduce the time commitment and expenses currently necessary to grind maize; a staple in their diet. The team began implementation this December collaborating with community members so that they will be able to reproduce a maize mill and perform maintenance when necessary. The community members will then be able to share their knowledge and recreate similar maize mills in

surrounding communities. The maize mill built in country differed slightly from the prototype due to constraints in materials and therefore requires improvements in a trip the team plans to take this summer. The team has been prototyping weekly and is confident in the abilities of a new design. We have also kept regular contact with the community in order to maintain a strong relationship and update them on our progress. Once completed the project will have a lasting impact by improving economic opportunities within the community.

VII. Major Accomplishments

- (1) Our December 2014 trip sought to assess the feasibility of the alternative bicycle-powered maize mill in Kumponda. Surveys were conducted to gauge interest of community members and leaders, and the community showed their willingness to support the maize mill project. The Kumponda Village Development Committee also expressed positive reception and feedback, ensuring potential project success through their partnership. While in the community, the team also identified costs associated with the current milling process, as well as prices and availability of local materials.
- (2) The primary accomplishment of our December 2015 trip was the construction of a bicycle powered maize mill through collaborative efforts with the community of Kumponda. During this trip, we built the human-powered maize mill with all in country, accessible materials and methods, including those that do not rely completely on the use of electricity. We did this step by step with the maize mill committee members (community members who created this committee to learn and understand the maize mill) in order for knowledge to be exchanged.

Although we did run into some challenges, which included the issue of engineering shops being closed due to the Christmas holiday, limiting our ability to find quality metal plates that would grind the corn. Due to this limitation of materials, the plates that were available were too thin to remain perfectly straight, it caused them to rub together, creating metal shavings. Therefore, since our return from the trip, the team has been working improve the grinding mechanism design to avoid the metal shavings and produce thinner consistency flour to better fit the community's needs.

Lastly, the team continued a good, open relationship with the community throughout the trip. Through this, the maize mill committee felt welcome to share their concerns, thoughts, or ideas with our team so we could work together to discuss and find a solution. This is very important for the continuation of the project, as the community members need to be involved and invested, so that the maize mill is successful and the knowledge learned from it is passed on.

- (3) We are in continuous contact with our local NGO contact, Daniel Mwakameka from Action for Environmental Sustainability (AFES) in Malawi. Through email and occasional skype calls, we discuss updates and resources available in country so that we ensure our project can be reproduced in country and that all is well.

During the quarter, we send Daniel newsletters about maize mill progress in addition to a monthly calendar with expected future progress dates and information about our team members. These are shared with the community, keeping communication open and consistent.

VIII. Expenditure of Funds

(details how Baker and Koob Endowments funds were used to meet project objectives)

Plane tickets from LAX to Blantyre, Malawi for three students

- Student 1 (Jennifer Tuttle) plane ticket = \$1,722.22
- Student 2 (Spencer Jemes) plane ticket = \$1,722.22
- Student 3 (Chris Apple) plane ticket = \$1,722.22 (Only \$555.56 of this ticket paid by Baker and Koob Endowment funds)

The \$4000 Baker and Koob Endowment fund we recieved went towards buying the plane tickets (a little over 2 tickets) for the travel team of EWB Cal Poly SLO Malawi to Malawi. This grant allowed us to reach our project objectives because we were able to meet, communicate with, and construct the bicycle powered maize mill with the community members. By having the ability to travel there, we were able to introduce a sustainable solution is a serious problem that the community faces daily, through implementing this project.

IX. Impact on Student Learning

(personal reflection by student detailing how project impacted student learning and career aspirations) Design impact, teaches engineering skills, community relations, cultural learning. People get involved, engineering disciplines.

The human powered maize mill gives over thirty students the opportunity to gain hands on engineering experience that connects their college education with real world application. Students who are involved learn how to safely operate tools, construct our human powered maize mill from start to finish, and practice mechanical engineering operations outside of the classroom. While in country, the community works alongside our student members learning construction techniques and providing a common ground for both sides to grow and learn from one another. The community learns technical skills while student members learn how to improvise during implementation. Students are continuously learning about the amazing Malawi culture from the community members as well. Students of all majors are involved in our club including business, anthropology and geology, and other engineering majors like biomedical, computer science, industrial, and aerospace, though the majority of the club is comprised of civil, environmental, and mechanical engineers.