ASABE's Giving Back Fund

TOGETHER *we can do* SOMETHING BIG

EWB-USA UMN team. Andrew Kanewske, Jeff Weiss, Kim Gustafson, Bradley Ni, and Danielle Chase.

Editor's note: Established in 2014, the ASABE Giving Back Fund provides financial support to projects that demonstrate the knowledge and skills of agricultural and biological engineers in benefiting underserved individuals or groups. Eligible projects may take place anywhere in the world; no preference is given for geographic location in the selection process. The project may involve building, designing, planning, teaching, or other assistance. The first Giving Back Award was presented to John Lumkes and the Purdue Utility Project (PUP). Partnering with the African Centre for Renewable Energy and Sustainable Technology (ACREST), the award funded low-cost utility vehicles for transporting crops, people, and supplies (www.asabe.org/awards-landmarks/giving-back-fund.aspx). Featured here are the latest awardees: the **University of Minnesota chapter of Engineers Without Borders** (2016) and **Planting Hope International** (2017).

Clean water for a school in Uganda

Walter Eshenaur, P.E.

The University of Minnesota chapter of Engineers Without Borders (EWB-UMN) established a relationship with Uganda Rural Fund in 2007. Hope Integrated Academy (HIA) is a school run by Uganda Rural Fund (URF), a 501(c)3 nonprofit organization focused on empowering people, especially women and children, in rural Uganda to rise above their impoverished beginnings. Established in 2008, the school provides low-cost primary and secondary education to over 300 youths from nearby communities. Additionally, the school has recently opened a children's home for orphans and more dormitories for boarding students. With this growth and the associated strain on resources, HIA was experiencing a shortage of water. Because of this water shortage, students had to collect water from a contaminated surface pond, located 1 km from the school, twice a day.

In August 2015, HIA and EWB-UMN created a partnership to solve this problem, and in September 2015, EWB-UMN began to design a sustainable expansion of the water supply at HIA. Because HIA had multiple newly constructed buildings, an expansion of the rainwater harvesting system could meet the needs of the growing school. Previously, low-cost brick and mortar tanks for rainwater collection were designed as an alternative to expensive plastic tanks. For this project, the design was scaled up to a 25,000 L capacity brick and mortar tank. The project included three of these tanks for the new girls' dormitory, boys' dormitory, and children's home, as requested by HIA. The new 75,000 L of rainwater storage was in addition to 96,000 L of rainwater storage at HIA.

In August 2016, four UMN students and one professional mentor traveled to Uganda to implement the project. For two weeks, HIA students and staff worked shoulder-to-shoulder with EWB-UMN to build all three tanks and install

Building a brick-and-mortar water tank (*left to right*): UMN student Danielle Chase and community member Yasin cover the foundation with banana leaves while it cures, the tank under construction, and the finished tank with cover installed.

UMN student Bradley Ni, HIA teacher Joseph, and two HIA students excavate the foundation for a water tank. The ground is extremely hard, and the team needed two days to prepare sites for three tanks.

gutters on the buildings. The HIA students and staff were able to learn about the design and construction of these systems during the construction process. This experience will allow HIA to further expand its rainwater harvesting capacity if more classrooms or dormitories are built.

The system was designed to meet several objectives, which will be monitored. First, the HIA community should be able to maintain the system over the long term. Additionally, if the school requires additional systems, the community should be able to construct new tanks and install gutters without the assistance of EWB-UMN. The tanks should fill during the rainy season and maintain a water supply throughout the dry season. The project will be successful if the students no longer need to use pond water for drinking, cooking, and bathing.

This project concludes a nine-year partnership between Uganda Rural Fund and the University of Minnesota chapter of Engineers without Borders. Both URF and EWB-UMN feel confident that Hope Integrated Academy has the infrastructure, knowledge, and experience to provide water for its growing student population.

Danielle Chase of EWB-UMN notes, "We are so incredibly thankful for the generosity of our many financial partners, including the ASABE Giving Back Fund, which supported many successful projects during our partnership with Uganda Rural Fund."

ASABE member Walter Eshenaur, P.E., Senior Associate, SRF Consulting Group, Inc., Minneapolis, Minn., USA, weshenaur@srfconsulting.com, www.srfconsulting.com.

Economic benefits for farmers in Laos

Floyd Dowell

The mission of our team in Laos is to improve the livelihood of rural Lao farmers through advancements in agriculture. We do this by partnering with Lao farmers and rural business people to create a domestic value chain for Lao agricultural products. Currently, most of the crops produced by Lao farmers are purchased by neighboring countries, often at a discounted price for the farmers. The crops are then processed into higher-value products, such as feed or food, and then imported back into Laos, or used for local livestock that is then imported back into Laos as meat. This feed or food is often sold at a premium to the same farmers who initially sold the grain at a discount.

Our team wants to break this export/import cycle and enable Lao farmers and rural business people to process their locally produced crops into products of value for sale in local markets. This is a multi-phase project that includes post-harvest processes such as grain drying, grain storage, animal feed production, and small-scale animal operations. Our goal is to establish rural outposts in the Lao countryside that serve as a base of operations for these activities at a local level. We refer to these sites as harvest centers.

We currently have four harvest centers in operation in the northern part of the country. While we have been pleased with the niche that each of these centers is serving, we have

A harvest center under construction.

been eager to find a site where we can set up a smaller village-scale center that can be established with a limited budget. At the village of Tako Hie, in Vientiane Province, we are establishing such a harvest center with the help of some local graduates from a Lao technical college. While these young graduates had opportunities to work in the city, they wanted to return to their village and improve the local economy through advancement of local agriculture.

In the summer of 2016, we set up a small-scale pig finishing farm that provides pork to the local market and fertilizer to local farmers. However, the feed used at this farm is sourced from one of our earlier established harvest centers, approximately 50 km away, in an area where transportation options are limited. Therefore, our goal is to establish the necessary grain drying, storage, and feed processing capability to allow the Tako Hie harvest center to process local grain into feed for the pig farm and make it available to other livestock farmers in the area. In addition to the local corn that will be used make feed, the harvest center will provide a custom grain drying service that can increase the marketing options and profit potential for farmers in the area.

Lao partners, Jay and Pheng.

The larger harvest centers work well, but there are engineering challenges in scaling down the drying, storage, and feed-making systems to the village level. The material and power restrictions associated with rural villages, and the requirement for a simple and minimalist approach, make the engineering quite challenging. While the fundamentals of grain storage and processing are known, applying them in an area with limited mechanization, limited affordable fuel and electricity, and limited material availability, combined with a tropical climate, requires creative solutions.

For example, while we performed the traditional engineering calculations for determining the amount of water that needed to be removed and the heat necessary to lower the grain moisture content to an appropriate level for storage and processing, we could not rely on liquid fuel or electric power to supply the heat. Thus, our calculations had to consider the heat value of the wood in the nearby jungle and other biomaterials that are readily available in the area.

For another example, in the U.S. we can readily source steel silos for a project like this, but these structures aren't easily available in Laos. This required that we engineer grain storage structures out of locally available steel and brick. Different combinations of materials and sizes needed to be evaluated to determine what was most effective for drying grain, and what was most cost efficient. A rewarding part of this exercise has been collaborating with the local people about what ideas might work best, evaluating their proposed designs with engineering calculations, and then affirming for them that their suggestions were good, and fundamentally sound.

In the short term, we hope that grain farmers in the Tako Hie area will benefit from a better market for their grain, and that livestock farmers in the area will benefit from a local and more affordable source of feed. As many as 100 farm families could benefit immediately from better markets for their grain, as well as increased options for storage and delayed marketing. As many as 100 livestock farmers could benefit immediately from a local and more affordable feed source for their animals.

In the long term, we hope that Tako Hie serves as a model for harvest centers that can be replicated across Laos, transforming the way the country feeds itself and the way that rural Lao farmers earn their living. While the immediate goal is to establish this specific harvest center, the larger hope is that it serves as an inspiration for complementary operations throughout the country. This could enable a revolution in agriculture and food production, led by the Lao people.

One of our primary aims throughout the process has been to incorporate sustainability into the harvest centers. While we provide the initial technical support and training, and assistance in organizing the initial funding, we want our Lao partners to take ownership of the harvest centers and feel responsible for making management decisions about operations, expansion, and diversification.

Another focus of our work is reproducibility. For a project to be reproducible in a country such as Laos, it must be cost effective. We strive to use funds effectively, not just to make the funding go farther but also to ensure that we create a model that can be replicated with as little financial burden as possible. This includes minimizing construction costs using locally available and affordable materials, investigating multiple equipment sources to find the least expensive providers, and partnering with local people for construction and fabrication to minimize labor costs.

We hope that the Tako Hie harvest center established by this project will have a long and fruitful life. More than that, we hope that the Tako Hie harvest center will have a lasting impact on rural Laos.

ASABE member Floyd Dowell, President, Planting Hope International, Manhattan, Kan., USA, plantinghope@yahoo.com, www.PlantingHopeInternational.org.