Document 522
POST-ASSESSMENT REPORT

CHAPTER: EWB-JSC South Houston Professionals
COUNTRY: Rwanda
COMMUNITY: Mugonero
PROJECT: Fruit Dehydration for Rwanda Orphanage

PREPARED BY
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ENGINEERS WITHOUT BORDERS-USA
www.ewb-usa.org

Post-Assessment Report Part 1 – Administrative Information

1.0 Contact Information

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Mugonero- Orphanage Director	Victor Monroy	Lesperancerwanda@aol.com	0025008545731	LEsperance Childrens Aid
Kigali- Materials/ Transportation Contact	Peter Muligo	peter.muligo@mannaenergy.com	07883000360	Manna Energy + US Embassy
Fruit Processing Expert	Ralf Loeper	ralfloeper@gmail.com	0784117252	GIZ
Wood Gasification Stove	Eric Reynolds	Eric.Reynolds@inyenyeri.org	+250(0)722592355	Inyenyeri
Rocket Stove	Amanda West	amanda@ecozoomstove.com	423-314-7306	EcoZoom

2.0 Travel History

Dates of Travel	Assessment or Implementation	Description of Trip
May 2005	Assessment	Mugonero Hospital (water quality/quantity)
January 2006	Implementation/ Assessment	Mugonero Hospital (solar lighting installation and water collection assessment)
June 2006	Implementation/ Assessment	Mugonero Hospital (rainwater catchment installation) Mugonero Orphanage (water quality/quantity assessment)
August 2007	Implementation	Mugonero Orphanage (water treatment installation)
August 2008	Assessment	Mugonero Orphanage (fruit drying)
August 2011	Implementation	Mugonero Orphanage (Solar Fruit Drying)
September 2012	Assessment	Mugonero Orphanage (Year Round fruit drying)

3.0 Travel Team

Name	E-mail	Phone	Chapter	Student or Professional
Angela Cason	secretary@ewb-jsc.org	832-385-4996	EWB-JSC	Professional
Tyler-Blair Sheppard	rwanda@ewb-jsc.org	540-336-7531	EWB-JSC	Professional

4.0 Health and Safety

4.1 Incident Reports

Did any health or safety incidents occur during this trip? ___Yes _X_No

If there were any health and safety incidents during the trip, check "Yes" and submit your completed 612 - Incident Report document as a separate attachment with this report. For further details, refer to this section in the 531 – Post-Assessment Trip Instructions. If there were no incidents, check "No."

5.0 Monitoring - Current Status of all Past-Implemented Projects in Program

Project Type	Project Discipline(s)	Date of Completion (m/d/y)	Functionality (enter one range per project)*			Periodic Maintenance* (yes or no)	Demonstration of Knowledge Transfer* (yes or no)
			0-50%	50-75%	75-100%		
Water Supply	Water Treatment	08/20/2007	75-100%			Yes	Yes
Agriculture	Crop Processing Equipment	09/08/2011	75-100%			Yes	Yes

6.0 Budget

6.1 Project Budget

Project ID: 802
Type of Trip: A

Trip type: A= Assessment; **I**= Implementation; **M**=Monitoring & Evaluation

Trip Expense Category	Estimated Expenses *(Fill in from Pre-trip Report)*		Actual Expenses
Direct Costs			
Travel			
Airfare	6000		$3964.72
Gas	0		$222.22
Rental Vehicle	0		0

Taxis/Drivers	0		$900.00
Misc.(In country contact meals)	0		$90.71
Travel Sub-Total	$0		$5177.65
Travel Logistics			
Exit Fees/ Visas	$0		0
Inoculations	$490		0
Insurance	$60		0
Licenses & Fees	$90		0
Medical Exams	$50		0
Passport Issuance	$0		0
Misc.	$0		0
Travel Logistics Sub-Total	$690		$0
Food & Lodging			
Lodging	$250		$57.14
Food & Beverage (Non-alcoholic)	$200		$39.68 (drinks) $15.10 (breakfast)
Misc.	$200		0
Food & Lodging Sub-Total	$650		$111.92
Labor			
In-Country logistical support	$750		0
Local Skilled labor	$0		0
Misc.	$0		0
Labor Sub-Total	$750		$0
EWB-USA			
Program QA/QC	$2000		$2000
EWB-USA Sub-Total	$2000		$2000
Project Materials & Equipment (Major Category Summary)			
Thermocouple			$39.68
Internet and Cell Phone Minutes			$11.11
Gift to Orphanage (Movies)			$46.46
Gifts to Victor (PB/Wine)			$39.52
L'Esperance fundraising in Houston donation			$250.00
Project Materials & Equipment Sub-Total	$0		$386.77
Misc. ***(Major Category Summary)***			
Report Preparation			0

Advertising & Marketing			0
Postage & Delivery			0
Misc. Other			0
Misc. Sub-Total	$0		$0
TOTAL	$0		**$7676.34**

EWB-USA National office use:

Indirect Costs			
EWB-USA			
Program Infrastructure	$0		$0
EWB-USA Sub-Total	$0		$0
TRIP GRAND TOTAL (Does not include Non-Budget Items)	$0		$0

Non-Budget Items:

Additional Contributions to Project Costs			
Community			
Labor	$13140		
Materials	$100		
Logistics	$0		
Cash	$20000		$7000
Other	$0		
Community Sub-Total	$33240		$0
EWB-USA Professional Service In-Kind			
Professional Service Hours	3000		
Hours converted to $ *(1 hour = $100)*	$300000		$300000
Professional Service In-Kind Sub-Total	$300000		$300000
TRIP GRAND TOTAL (Includes Non-Budget Items)	$300000		$300000

Chapter Revenue

Funds Raised for Project by Source	**Raised Before Trip**		**Actual Raised by end of Trip**
Source and Amount *(Expand as Needed)*			

Engineering Societies	$0		$0
Corporations	$6350		$6350
University	$0		$0
Rotary	$4500		$4500
Grants - Government	$2000		$2000
Grants - Foundation/Trusts	$0		$0
Grants - EWB-USA program	$0		$0
Other Nonprofits	$0		$0
Individuals	$13607		$13607
Special Events	$0		$0
Misc.	$0		$0
EWB-USA Program QA/QC Discount Amount			
EWB-USA Program Infrastructure Discount Amount			
Total	$24657		$24657

6.2 Professional Mentor/Technical Lead Hours

Name(s) of Professional Mentor(s) (student chapters) Technical Lead(s) (professional chapters)	**Pre-trip hours**	**During trip hours**	**Post-trip hours**	**Total Hours**
1. Tyler-Blair Sheppard	100	56	20	176

7.0 Project Discipline(s): Check the specific project discipline(s) addressed in this report. Check all that apply.

Water Supply
____ Source Development
____ Water Storage
____ Water Distribution
____ Water Treatment
____ Water Pump

Sanitation
____ Latrine
____ Gray Water System
____ Black Water System

Structures
____ Bridge
____ Building

Civil Works
____ Roads
____ Drainage
____ Dams

Energy
____ Fuel
____ Electricity

Agriculture
____ Irrigation Pump
____ Irrigation Line
____ Water Storage
____ Soil Improvement
____ Fish Farm
_X__ Crop Processing Equipment

Information Systems
____ Computer Service

8.0 Project Location

Latitude: E 29 º 17.264’
Longitude: S 02 º 10.032’

Post Assessment Report Part 2 – Technical Information

1.0 EXECUTIVE SUMMARY

The EWB - USA South Houston Professionals Chapter performed an assessment trip from September 13-21, 2012 in support of their Fruit Dehydration for Rwanda Orphanage project, which is project number 802. The focus of the trip was the fruit dehydration project; however monitoring activities were performed on the Bring Your Own Water (BYOW) system installed previously, as part of an ongoing agreement with Manna Energy Limited (Manna), which has taken over ownership of the BYOW system.

It is the intent of this project that a sustainable fruit drying system will be installed at the Mugonero Orphanage. This effort, undertaken entirely at the behest of the community, will serve as the lynch pin for a dried fruit export business, the revenues of which will be directed to serve the housing, health and educational needs of the 127 children at the orphanage.

The L'Esperance Children's Village Kigarama is an orphanage in rural Rwanda near both the town of Kibuye and the Mugonero Hospital. The orphanage is home to 127 orphans, and was founded to care for children orphaned during the 1994 Rwandan Genocide, several staff members live either at the orphanage, or immediately outside the gate, bringing the total population of the community to approximately 150. The community leader is the orphanage director, Mr. Victor Monroy. While the orphanage comes under partial managerial and financial direction by the Seventh Day Adventist Church, a number of NGOs and several EWB chapters are involved in projects at the orphanage. A current community agreement for the fruit dehydration system was signed during this assessment trip and is attached.

EWB-USA South Houston Professionals has a long and productive history with the community, which predates the current fruit drying project. The program began in 2006 with an assessment trip for the 2007 implemented BYOW project. The resulting productive relationship caused the orphanage director to request our involvement what the community calls The Orchard Project. It was decided that EWB-USA South Houston Professionals involvement will be to deliver a sustainable fruit drying system. Since the handoff of the BYOW system to Manna, this is now the only project within the Mugonero program. Previous trips for the fruit drying system have included an assessment/pilot implementation in 2008 and an implementation trip in 2011 where three solar dryers were installed as training and demonstration articles.

During this assessment trip, a design of the process hall was completed, in cooperation with Mr. Ralf Loeper, who is the overall project manager and a fruit processing expert, and Mr. Monroy. This design paid particular attention to the sanitation and handling requirements required for international food standards, and the interface between the proposed dryer design to be implemented by EWB-USA South Houston Professionals. Final setting of the dryers was established and measurements taken of the area, and the dimensions of the dryer physically mapped out on ground and reviewed with both Mr. Loeper and Mr. Monroy. Since construction of the building to house the dryers will be undertaken by the community, designs for this

building were reviewed with JP Habanabakize to garner his input and approval. Mr Habanabakize is responsible for new building construction at the orphanage and recently built a new laundry facility at the Mugonero Hospital. Finally, extensive time on this trip was spent in Kigali visiting local electronics, hardware, automotive and other suppliers to determine the availability of all materials currently intended for use in the dryer design.

Specifically, dimensions of the area available for foundation and the structure to be built to house the dryer were gathered. Details on the wall thickness of the current process hall building and the wall design, the height of the roof eves and the clearance available for the current rainwater catchment system were also determined. Specifics on material availability such as suppliers, contact information, cost, availability and requirements to preorder materials were also determined, both in Mugonero for construction materials, and in Kigali for more specialized equipment.

The next stage of this project will be to continue with the design and testing of a full scale test article, already underway, in Houston. Data gathered about material availability, manufacturing capability as well as specific physical data bout the dryers' construction location will be crucial for completing the design, with implementation targeted for summer, 2013.

2.0 INTRODUCTION

The Johnson Space Center (JSC)/South Houston Professional chapter of Engineers Without Borders-USA has been working in Rwanda since 2005 on water treatment, water provisioning, and energy provisioning appropriate technologies in the Mugonero region. After installing a water treatment system at the L'Esperance children's orphanage in the summer of 2007, the team has focused its efforts to help the orphanage reach economic sustainability through the processing and sale of dried fruit. An initial fruit drying assessment trip in 2008 provided additional information and important lessons learned. This led to an implementation trip in 2011 where a solar dehydration prototype system was installed and tested. At the time of the 2011 trip, it was recognized that an entirely solar based drying system would be insufficient to dry all the fruit the orphanage will ultimately produce, due to substantial portions of the year where sunlight is not prevalent, however was necessary to implement as a training article.

This assessment trip gathered the information required to implement a year round dryer system at the orphanage. This included significant time in Kigali dedicated to locating items know to be required in order to build a dryer capable of producing dried fruit to standards required for sale on the international market; temperature and electronic control systems, and food grade materials have all been determined through both comparative analysis and through consultation with several food service and import companies to be essential to producing edible product to international food export standards. These materials were all determined to be either available in country, or able to be ordered and delivered to Kigali.

3.0 PROGRAM BACKGROUND

The South Houston Professionals chapter has for several years worked to engineer infrastructure solutions at the L'Esperance Children's Village Kigarama. EWB-JSC has been responsible for providing a successful Bring-Your-Own Water (BYOW) purification and filtration system to the orphanage and has historically collaborated in varying levels of effort with EWB Colorado on several other projects, including rainwater catchment, solar power, high efficiency cook stoves, and crop irrigation. As mentioned in the Executive Summary, monitoring of the BYOW systems was handed over to Manna in 2010.

4.0 PROJECT DESCRIPTION

In 2007 Mr. Monroy asked EWB-JSC to assist in developing infrastructure for an ambitious agricultural project he was initiating, called the Orchard Project, which would allow the orphanage to become economically self-sufficient and independent of the Adventist Church by selling high quality premium produce in the developed world. Drip irrigation, water storage, food processing, sterile facilities, water management, waste management, packaging, food storage, pre- and post-processing, and improved energy infrastructure are all necessary features of this endeavor. Fruit drying is on the critical path to success of this project because (1) the orphanage lacks sufficient electricity to refrigerate the fresh produce, (2) transportation to the markets is not possible on a schedule to keep fruit from spoiling, and (3) roads follow 26 kilometers of exceptionally tortuous dirt paths that would bruise whole produce and (4) shipping costs to foreign markets would be greatly reduced by removing water weight from the fruit, which accounts for ~85-90% of the fruit weight. The orphanage currently is using the solar dryers built by EWB-USA South Houston Professionals in 2011 to dry small quantities of pineapple as the weather allows, and has set up two displays of their product in Kigali advertising their dried fruit. Furthermore, in April 2012, pineapple dried by the orphanage began being sold at two stores in Kigali. However, at this point in the development of the Orchard Project, a means of expanding the fruit drying capacity beyond that provided through the solar dryers is needed. This expansion is required both in terms of the quantity of fruit dried and in the availability of drying independent of the weather.

During the 2011 implementation trip, the travel team discussed in detail the site location of a future process hall at the orphanage, which was originally to be built in the summer of 2012. It was made clear to the 2011 travel team that in order to meet most international food safety standards for food processing, it is important to keep all sliced fruit inside the process hall until it is dried and packaged.

Discussions with the Orphanage Director in July 2012 indicated to the chapter that the community's plans to build the process hall as a new structure was a wise use of finances, and that the process hall will now be located in an already existing structure at the orphanage. This building was originally built to house classrooms for a technical school that the orphanage was going to set up as another fundraising business, however due to a variety of constraints, efforts to start a technical school at the orphanage have been ceased, freeing the existing building for use as the Fruit Processing Hall.

The dryer project is part of an overall system engineering project that brings in a variety of different groups and projects, of which EWB-South Houston Professionals is a part, and the overall management of which is led by Mr. Loeper, with input from the community and Mr. Monroy. A simplified process flow diagram of the systems architecture is provided in Figure 1.

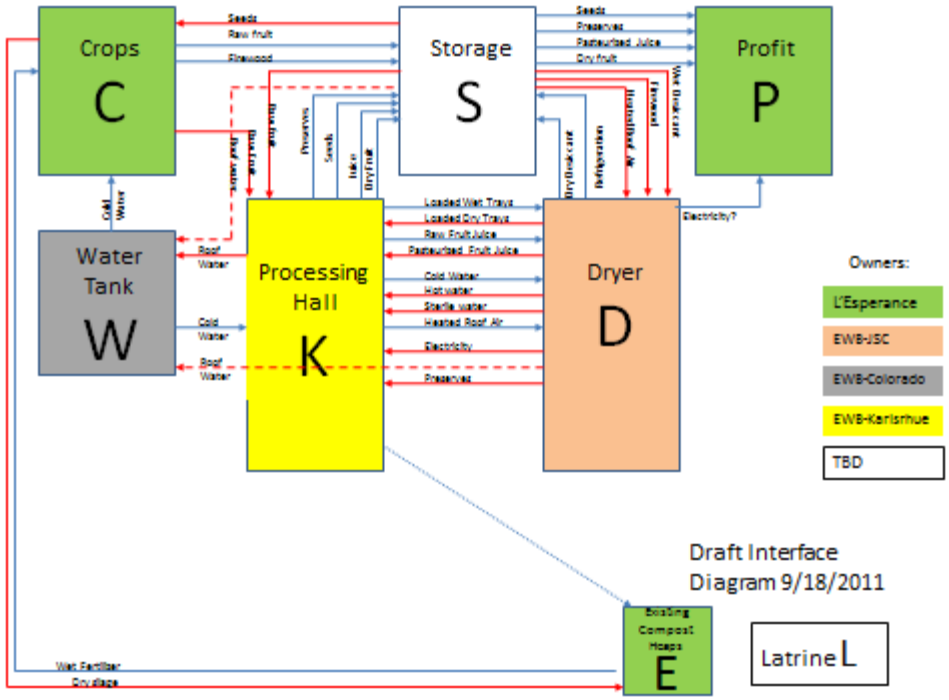

Figure 1 Orchard Project Systems Architecture

5.0 TRIP DESCRIPTION

The goal of this assessment trip was to gather information on the physical location of the dryers, to further refine understanding of material availability in country, and help determine the quantity of dryers required by the orphanage. This was done by performing a site assessment at the new process hall location to better determine spatial constraints on the dryer systems. In the immediate vicinity of where the dryers are to be built is a south facing slope, a rainwater cistern and associated collection infrastructure, the existing building that will become the processing hall, property lines, as well as the potential need for access for future infrastructure, such as fruit waste chutes out of the hall that will carry waste to compost piles at the bottom of the hill. The physical area was surveyed prior to the assessment teams' arrival by the EWB-UC-Boulder Chapter. This survey is shown below.

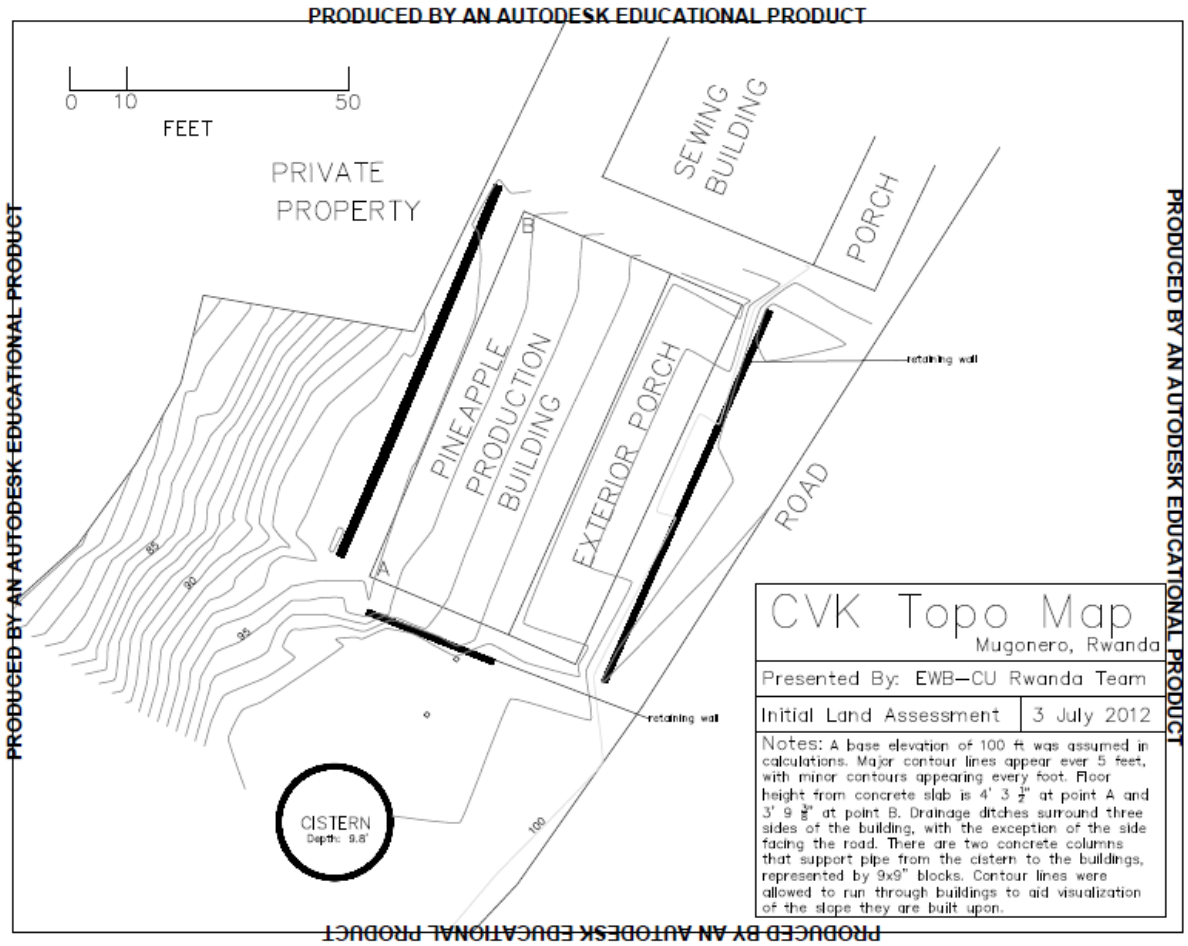

Figure 2 Process Hall Topographic Map

The second half of the trip focused upon material location and sourcing in Kigali, in order to establish sustainability of the dryer systems. Cost, dimensions, materials were determined, as well as contact information for the suppliers. Additionally, machine and metal working shops were located and dryer designs reviewed with staff to determine ability to manufacture items locally prior to implementation team arrival. Contact information for the workshops were collected in order to provide CAD models with dimensions for manufacturing.

6.0 COMMUNITY INFORMATION

6.1 Description of Community

L'Esperance Children's Village Kigarama is an orphanage in rural Rwanda near both the town of Kibuye and the Mugonero Hospital. The orphanage is home to 127 orphans, and was founded to care for children orphaned during the Rwandan Genocide in 1994. The orphanage comes under managerial and financial control of the Seventh Day Adventist Church, and its on-site director is Mr. Victor Monroy, a horticulture engineer originally from Guatemala.

The orphanage consists of a large number of buildings that are built along the crest of a ridge, which is itself a spur off of a larger mountain ridge. There are 7 buildings which function as the houses for the children, clustered at the east end of the ridge. At the extreme east end of the ridge top is the house of the orphanage director and the cistern and BYOW system previously installed by the South Houston Professionals. Mixed in among the children's houses are three kitchens used to cook for the children, as well as latrines and showers. In the middle of the ridge are a number of storage buildings, the orphanage director's office and housing for some orphanage staff. At the west end of the ridge are the two buildings originally intended to house the technical school, the easternmost of which will become the Fruit Processing Hall, as well as a 73 m^3 cistern for rain water catchment off those two buildings. Finally, at the extreme west end of the ridge is the entrance to the orphanage, which is gated and contains a guard room which is manned during evening hours. Along the crest of the main ridge, just outside the gate runs the main access road, which branches off the Class B road from Kibuye to Cyangugu. Neither of these roads are paved. A map of the orphanage is provided below. A larger copy is provided in Appendix C

Figure 3 Community Map (Contours at 20 m)

6.2 Community and Partnering Organization/NGO Resources and Constraints

The Children's Village Kigarama is located in a remote, rural region of western Rwanda. As a result, material resources and potential must be maximized. The lack of grid based electrical power, plumbed water and other resources affects the design and use of everything at the orphanage. This is the primary factor contributing the orphanage's decision to pursue drying the fruit produced at the orphanage and was a key reason that EWB-JSC pursed a solar drying system initially.

The year round drying system will require a significant amount of heat to dry the fruit input to roughly 10% water by weight. Analysis of potential heat sources available have identified that the dryer will require the combustion of either wood or pellets as a heat source, and the current dryer design will maximize the use of these resources. Wood will be provided from stockpiles at the orphanage and the 7-10 thousand eucalyptus trees planted by the orphanage during the past year. The production of pellets locally is currently being pursued by the orphanage, to provide an alternative to wood.

Previous assessments at the orphanage conducted by EWB-JSC have determined that solar power is the most appropriate system of supplying electrical power to the dryer fans and controllers, but the system is being designed to minimize power requirements. Part of this minimization will be to restrict dryer operations that cannot be automated to daylight hours. Solar panels have already been installed by other groups on the director's office to provide limited electrical power for computers, some lights and other use.

The orphanage itself is operated and partially funded by L'Esperance, a German based NGO operated affiliated with the Seventh Day Adventist Church. Furthermore, the people of the region around the Children's Village are largely Seventh Day Adventists as well. As such, Saturday is widely viewed as a religious rest day in the community, although this is not universal and work is done by non-Adventist members of the community on Saturdays. L'Esperance funds roughly 20% of the orphanage's day to day operations. The remainder is made up of funding from the Government of Rwanda, a variety of grants and private donations. New projects, such as the Orchard Project, are funded in part through excess funding, grants and donations.

Buildings at the orphanage have been built entirely through hiring local masons, brick layers and carpenters, with construction done under the supervision of Jean Paul, the facility manager of the orphanage. These skills will be utilized by EWB-JSC to construct the foundation and walls of the dryers, as well as any modifications required for access requirements to the current process hall.

There are a large number of groups working at the orphanage, but ones working on projects that impact the Orchard Project include;

Group	Task	Impact to Orchard Project
EWB- US Air Force Academy	Rebuilding Cow Stable	Expansion of stable provides fertilizer for orchard
iCATIS (Birambye Int)	Construction of Eco lodge, kitchens	Potential sale location for dried fruit

Ralf Loeper	Orchard Project Manager	Project Manager, Design of Processing Hall
EWB-Wisconsin	Biogas	Potential use in dryers

Documentation of items from the trip took place in the form photos and written documentation. Previous trips have documented interviews with orphanage staff via video, which has proven an asset upon return to the United States. Additionally, due to the longevity of EWB-JSC's involvement with the community and excellent working relationship with the director, most of the dependencies of the dryer and the needs of the community are well understood by EWB-JSC. As such, the focus of this assessment trip was to determine the spatial constraints in the new location and specialized material availability, as well as fabrication abilities both locally and in Kigali.

6.3 Community Relations

EWB-South Houston Professionals have been working with Victor Monroy and his staff since 2006. Mr. Monroy recently went on a fundraising trip through the United States and traveled through Houston. During his week in Houston Victor met with the entire South Houston Professional chapter to discuss his expectations for the chapters work and his pleasure of working with the chapter. EWB-JSC has a strong working relationship with the both the orphanage, its staff and Mr. Monroy.

6.4 Community Priorities

As a working orphanage, the priority of the Children's Village Kigarama is the housing, well-being, education of the children, and providing for their future. Part of providing for the children's future, in terms of funding the operations of the orphanage as well as sending the children to school and eventually university is the income stream that comes from The Orchard Project. Over the past 5 years, the orphanage has planted over 22000 pineapple plants, as well as 1500 Mango and 2500 Guava trees. Additionally, the orphanage has been working with a German food processing specialist, Ralf Loeper, who serves as the project manager. In the spring of 2012, Mr. Monroy embarked upon a month long fundraising tour of the United States to raise startup capital for the Orchard Project. These actions clearly establish the dedication to the overall project within the community. Furthermore, during the 2012 assessment trip, Mr. Monroy asserted that completion of the Orchard Project is his highest priority project.

7.0 DATA COLLECTION AND ANALYSIS

7.1 Summary of Data

Data collected on this trip included the dimensions of the Process Hall, the area next to the Hall where the dryers will be built, as well as specifics such as distances to other structures,

clearances for the rainwater catchment system on the Hall, and extensive discussions with local builders, Mr. Loeper, and Mr. Monroy. As extensive design work has already occurred in Houston based upon prior knowledge of the area of concern and in collaboration with Mr. Monroy, a great deal of the assessment was confirming data and laying out the design physically using flags and tape, accompanied by CAD drawings to review the dryer design with both Mr. Loeper and Mr. Monroy. Most of the data collected was specific to ensuring there was space for the designs to be implemented and that the new building to house the dryers could be attached to the existing Process Hall.

The interface between the new dryer building and the Process Hall is represented in blue in Figure 4, while samples of the dimensions that were taken are provided in red.

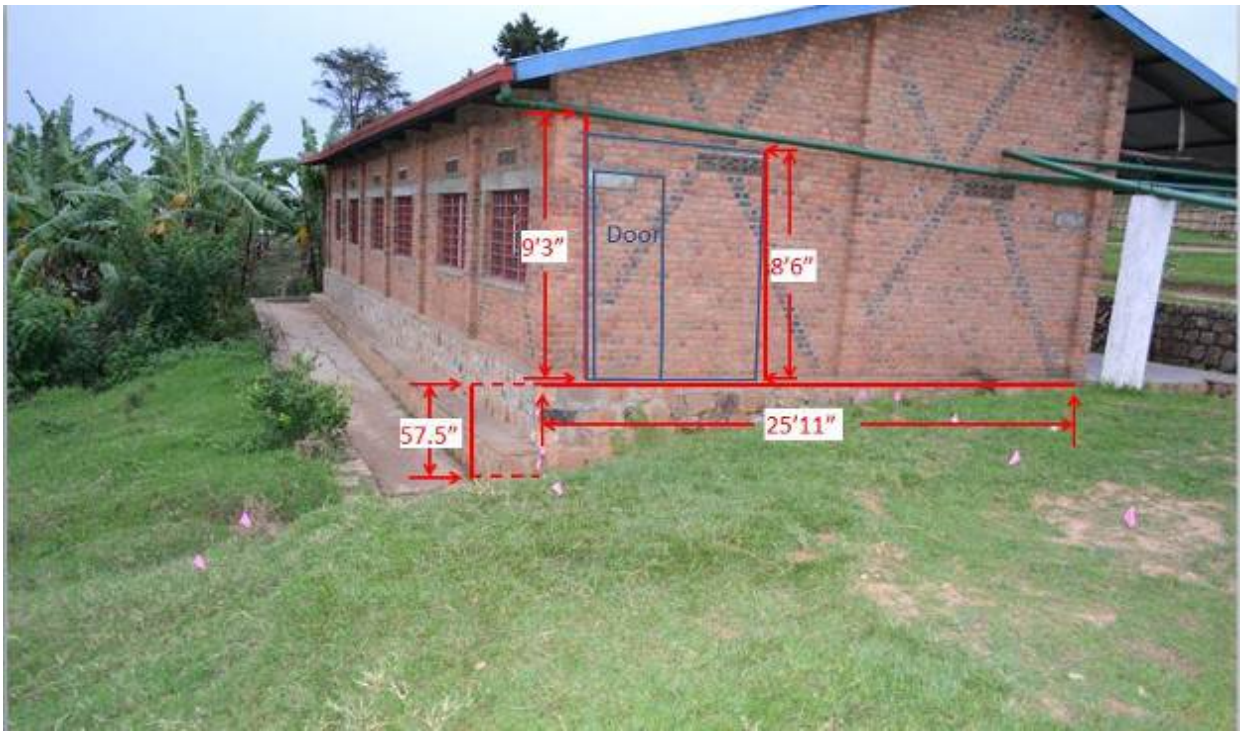

Figure 4 Process Hall Interface

As mentioned earlier, in order for international food standards to be met, the dryers should be contained in the same structure as the food processing work. This mandates that a door be knocked into the eastern wall of the Process Hall. This was reviewed with Mr. Loeper, Mr. Monroy and with a local civil engineer who works in the region and who built the 73 m^3 cistern to the east of the Processing Hall, and deemed the insertion of the door in the wall to be possible.

A major goal of this trip was to evaluate the area to the east of the Process Hall, to establish the exact configuration of the dryers as they would interface with the Hall, with the topography of the hill, and to determine any constraints that exist. The dryer building, with the four dryers to be built, is shown in blue in Figure 5.

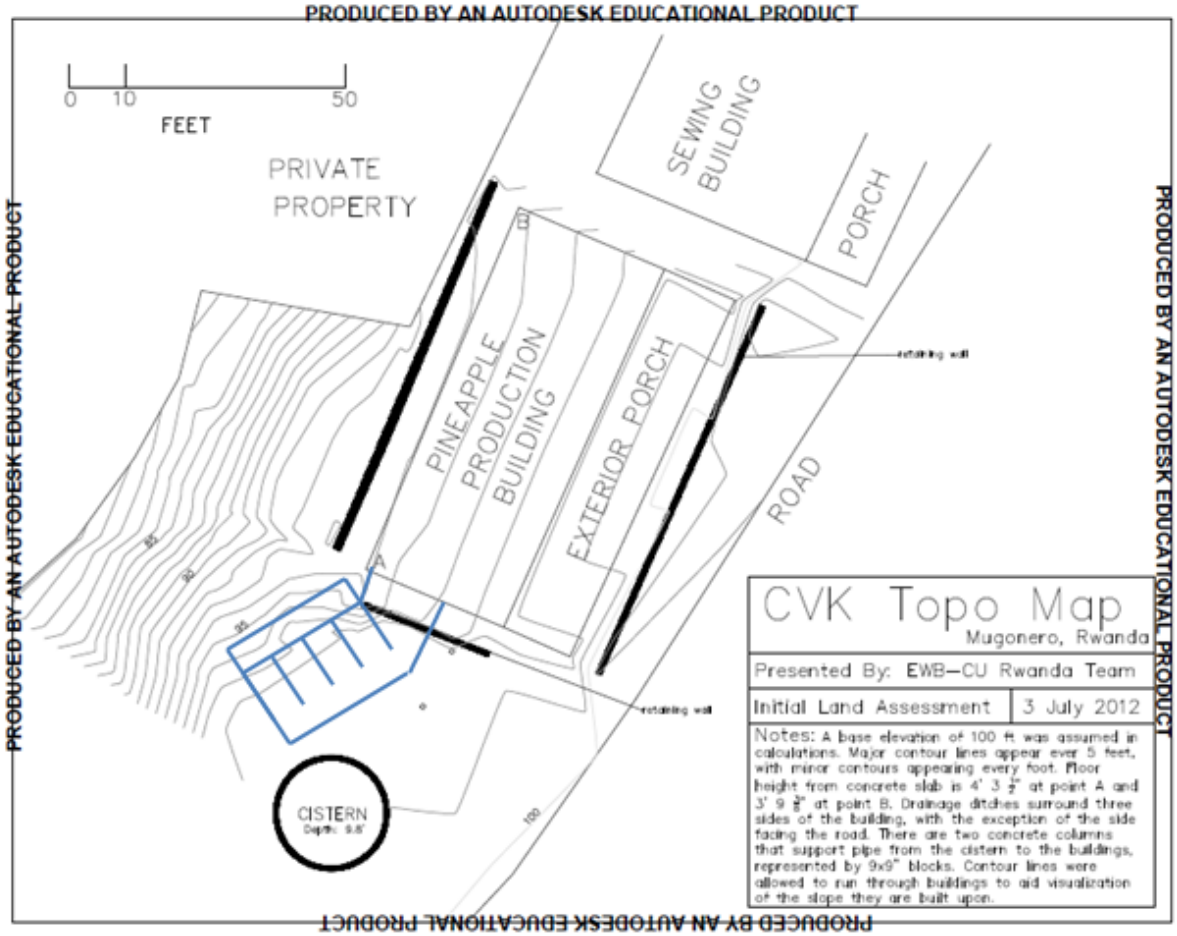

Figure 5 Dryer Interface with Process Hall

As the dryers will have a need to have a stove to be put under the heat exchanger section of the dryer, it is desired to locate the dryers on the slope that drops off to the south of the Hall building as a method of minimizing excavation requirements. Additional constraints on the dryer structure will come from the cistern to the east, as well as a drainage ditch that will need to have a culvert built underneath the structure.

It is important to note that a community agreement was signed during the trip where the community accepts responsibility for building the dryer structure. They have hired a local civil engineer, JP Habanabakize, who has built a number of structures at the orphanage, for example both cisterns, as well as a large laundry facility at the Mugonero Hospital in 2011, establishing his ability to build complex structures using local materials, expertise and standards. While at the orphanage, EWB-South Houston Professionals met with him to discuss the design and the feasibility to construct it. The design will also be reviewed by EWB-South-Houston Professionals civil engineering members, and a portion of the implementation next year will occur during the building construction to ensure dryer compatibility.

7.2 Mapping

Topographic information is provided in Appendix A. Beyond the topographic information, further mapping is not required for this project.

8.0 MONITORING

8.1 Monitoring plan for current project

Monitoring of the year-round fruit drying project that was assessed on this trip will be done by the three below metrics.

1. Weight measurement of mass loss of the fruit in the drying process to confirm fruit is fully dried to the 10% moisture level to confirm the fruit is fully dried.
2. Duration to dry the fruit. The system is designed so that the fruit will be dried within 24 hours.
3. Bacterial testing of the fruit before going into the dryer and when drying is completed to ensure no contamination occurs.

8.2 Monitoring of past-implemented projects

Project Type	Project Discipline(s)	Date of Completion (m/d/y)	Functionality (enter one range per project)*			Periodic Maintenance* (yes or no)	Demonstration of Knowledge Transfer* (yes or no)
			0-50%	50-75%	75-100%		
Water Supply	Water Treatment	08/20/2007			75-100%	Yes	Yes
Agriculture	Crop Processing Equipment	09/08/2011			75-100%	Yes	Yes

8.2.1 Functionality Status Supporting Information

The 2007 installed water treatment system, BYOW, is monitored by one of the EWB-South Houston professionals in country technical contacts, Manna Energy. The BYOW is in use daily by the orphanage to process treat water for the children and orphanage guests.

The three 2011 implemented solar fruit dryers are in use by the orphanage to dry loads of pineapple every three days. The bacterial testing materials were removed from the traveler's luggage during transport to Rwanda and therefore testing was unable to be performed. Based on responses from visitors to the orphanage and the orchard project manager the dried fruit product is of high quality.

8.2.2 Periodic Maintenance Supporting Information

Manna Energy confirmed that inspection of the BYOW occurs 3 times a year when they're in country support is in the orphanage area. No major maintenance has been required since the initial installation only periodic backwash and cleaning of the system is required. The process to complete these tasks is included in the maintenance manual for the BYOW.

Maintenance of the 3 solar dryers has not been required other than one item. The lid of one of the dyers became warped in the humidity. The fruit processing orphanage team created a method to seal the lid. An inspection of the implemented solution occurred and efficient sealing was reached with the orphanage solution and will continue to be in place until the year-round dryers are built.

8.2.3 Demonstration of Knowledge Transfer Supporting Information

The daily operations of the BYOW were observed and all the necessary steps in the water treatment occurred.

The initial fruit process for the pineapple was setup for the orphanage was trained to Samuel the fruit processing lead. Since the system was installed, Samuel returned to his car repair maintenance training and John Du Dieu took over the fruit processing. The travel team observed John completing the fruit processing and was satisfied that all training that was provided to Samuel has been transferred to John.

9.0 COMMUNITY AGREEMENT/CONTRACT

ENGINEERS WITHOUT BORDERS USA

Community Agreement between EWB-USA South Houston Professionals and L'Esperance Children's Aid Orphanage.

This agreement between the EWB-USA South Houston Professionals Chapter and L'Esperance Children's Aid Orphanage provides the framework for a continued collaborative effort. It is agreed upon that EWB-USA South Houston Professionals will provide a year round dryer system design capable of drying the Orphanage's daily production capacity of pineapple. During implementation, L'Esperance will finance and build the foundation and structure for the dryer based upon required dimensions provided by EWB-USA South Houston Professionals. The outfitting of the structure and will be undertaken by EWB-USA South Houston Professionals. The training of Orphanage staff on dryer operation and maintenance will be the role of by EWB-USA South Houston Professionals, with full responsibility for dryer operations to be transferred to L'Esperance within a period not to exceed five years.

Signed September 17, 2012
Kigarama, Rwanda

Victor Monroy

Victor Monroy
Director L'Esperance Children's Aid Orphanage

Angela M Cason

Angela Cason
Secretary
EWB-USA South Houston Professionals

Tyler-Blair Sheppard
Rwanda Project Lead
EWB-USA South Houston Professionals

10.0 PHOTO DOCUMENTATION

Review of dryer design in the processing hall building with orphanage director and orchard project manager.

Dryer building layout in blue tape for review with orphanage director, orchard project manager, and building construction lead.

Materials shopping in Kigali


Potential stove for dryer heat testing and demonstration

Monitoring of pineapple processing for solar dryers

Solar dryer monitoring

11.0 PROJECT FEASIBILITY

The year-round fruit dehydration project is feasible based on the assessment trip. Discussions with the fruit drying project lead on how to integrate the dryers into the processing hall to ensure HSAP protocols are met for food products occurred. Materials sourcing in Rwanda or having

items ordered by the orphanage and shipped to Rwanda is feasible. Therefore, the EWB-South Houston professional's chapter will continue the design and testing of the dryer design and plan to implement the design in 2013.

12.0 LESSONS LEARNED

Travel:
In order to not have one member bankroll flights costs, select preferred flights for travel. Then provide preferred flights to all travelers to book their flights individually. This was not a problem for this trip, but is an anticipated one for the implementation trip, which will be much larger.

Health and Safety:
For future trips organize first aid and CPR trainings earlier to allow for additional HSOs for all trips. This would aid in traveler selection.

Community Documentation:
Assign a traveler to track all expenses for EWB-USA documentation. Setup a camera to record any key questions for the main community point of contact to ensure accurate transfer to the entire chapter.

13.0 PROJECT STATUS

Design:
The project will continue through the design process. The dryer design was required to have gone through a preliminary design review prior to the assessment trip to accurately access material availability and dryer building sizing. It will now go through a chapter safety assessment, as well as the normal processes required by EWB-USA for implementation.

14.0 PROFESSIONAL MENTOR/TECHNICAL LEAD ASSESSMENT

14.1 Professional Mentor/Technical Lead Name (who provided the assessment)

Tyler-Blair Sheppard, Rwanda Project Lead

14.2 Professional Mentor/Technical Lead Assessment

This report was written as a collaborative effort between the travelers. The trip overall was very successful in terms of accomplishing all objectives on time and under budget and with minimal issues. Furthermore, the potential for collaboration with a variety of stove and fuel suppliers was broadened through meetings and conversations during the trip.

The EWB-South Houston Professionals chapter is on an excellent course with respect to this project. Supportive chapter leadership has allowed the design and planning to move forward and to generate real progress on a very difficult project. I am confident that South Houston Professionals will be able to move forward with the next step, which will be to test and implement a year round dryer design next year.

14.3 Professional Mentor/Technical Lead Affirmation

As the project technical lead for this trip, I affirm that I was involved in all aspects of the trip planning and execution and accept responsibility for the direction the project as a whole is taking

