Executive Summary

Food dehydrators are used to preserve fruit, vegetables, and animal proteins after harvest. The citizens of Panyebar, Guatemala need a food dehydrator to preserve the micronutrients needed to feed themselves and their children. A decision matrix with the governing parameters of product cost, function, safety, reliability, quality, and operating instructions was created to determine which type of solar dehydrator design best met the customers design parameters. Through this decision matrix, it was determined that the updraft design was the best solar dehydrator design. An updraft solar dehydrator consists of two main parts, the collector box where a greenhouse effect is created to heat up the air coming into the dehydrator, and the drying chamber where the hot air is used to dehydrate racks of food. This air then exits out a chimney at the top of the drying chamber. The final design of the updraft solar dehydrator consisted of a polycarbonate cover and steel lath for the collector box. XPS insulation and water bottles as a thermal capacity to keep inside of the drying chamber hot at night and 5 molded polypropylene drying racks spaced 3 inches apart from each other in the drying chamber. Adjustable vents placed on top of the chimney to increase the temperature (fully closed position) or increase the air flow (fully open position) when needed, and finally wheels at the front for mobility. The final design was tested with eight 250 Watt heat lamps being placed orthogonally 6 inches above the polycarbonate cover to replicate the sun. It was found that the drying chamber reached a max steady state temperature of 52 (lower drying rack) and 46 (upper drying rack) degrees Celsius under those conditions resulting in a water content loss of 73.2% and 91.1% in 8 hours

for bananas and tomatoes respectively. The air flow through the system at these temperatures was 0.9 m/s. It was also found that the thermal capacity caused the drying chamber to reach an average steady state temperature of 9 degrees Celsius above the ambient room temperature. This resulted in a constant air flow through the system of 0.1 m/s which is needed to prevent mold growth overnight.