Overview of the Problem

Irrigation systems in the United States are efficient in certain areas but also lack certain aspects. One of the most successful irrigation systems is Drip irrigation, and the team found problems even with the best irrigation system. The Water Filtration Process is inadequate and can be made better by using a Slow Sand Filter. Using Nylon Tubing instead of the traditional polyethylene tubing can increase the lifespan of the tube. Saving energy in this era is extremely important, hence, the team decided to switch the traditional batteries being used in the system with Solar Powered Batteries.

Engineering Design Process

The team’s approach to designing an improved irrigation system consisted of many idea and concept generation tools. The team evaluated what the needs of farmers were and discovered that for drip irrigation systems; clean water, durable tubing, and appeal to larger farms were in demand. Throughout our concept generation process, the team decided that the best route was to expand upon an existing system and improve it so that the design requirements are met. It was deemed that efficiency, ease of manufacturing, safety and cost were the team’s highest priorities. A Drip Irrigation system that uses the Slow Sand Filter was the concept that the team decided to work with. A slow sand filter uses a biological layer, called a Schmutzdecke, to properly filter water. This process was both efficient and safest for the environment. Our final concept also consisted of using Nylon tubing, which lasts longer than traditional tubing and solar powered batteries which helped to save energy. This new system not only helped improve food safety and environmental factors, but it was also economically excellent.
Analyzing and testing the design, the team dove deeper into the requirements of design, filtering, and cultural acceptance. The team reported that a typical large sized farm of 1600 acres would profit more with our new proposed idea than using a normal system. This was due to reduced costs in maintenance, materials, and water. The profit from our system was $1433.97. Regarding the filtering abilities, proven by the CDC, Slow Sand Filters are extremely effective in filtering water as it is a natural process that is safest for the environment. However, the process does take around 2 days to be fully filtered, which can be a disadvantage. Testing the cultural acceptance, the team researched that many farmers prefer this method regarding food safety as they know this process is secure. Many farmers prefer safety over time of filtration, which further showcases how our idea will be widely accepted.

Outcomes and Recommendations
The Nylon Tubing is water resistant and safe for food. It ensures environment safety along with ease of production. Colors like red and blue do not absorb UV rays, hence prolong the lifespan of the tubes. By replacing the traditional battery-operated timer with a modern solar powered system, the team ensured that the environmental aspect of production was taken care of. It not only helps with emitting less pollution into the air but also saves energy, time and money when the issue of battery replacement arises. Moving to the teams third and final design update, the slow sand filter has a high initial cost, but is neutralized by the benefits and outcomes it has to offer, for example: it is highly effective in the removal of impurities from contaminated freshwater and can withstand fluctuations in water quality. Once the proposed design is in use, one of the recommendations from the team would be to hire extra workers to ensure proper functioning of the entire system.