**Problem Statement**
Water resource distribution is a vital challenge to improve crop production. Small scale farmers are in need of an inexpensive and reliable system to irrigate crops and increase production. A solar powered pump could be the solution for many farmers across the globe.

**Objectives**
1. Pump prototype
2. Build a system prototype
3. Field test prototype
4. Evaluate pumping rate

**Timeline**
- Fall: Research, Calculations, Order Materials, Construct Prototype
- Spring: Construct Second Prototype, Data Collection, Analysis

**Constraints**
- Budget
- Low Maintenance
- Simplicity
- Water Quality
- Sun Intensity
- Elevation Change
- Energy Storage
- Pressure Capability
- Acreage

**Size Requirements**
- 250 Gal/AC/Day
- 2.1 GPM
- 60 PSI
- 1/2” Input Hose
- 3/8” Output Hose
- 100 W Panel
- 34 AH Battery

**Cost Analysis**

<table>
<thead>
<tr>
<th>Component</th>
<th>Farmer’s Cost</th>
<th>Project’s Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Panel</td>
<td>$79.99</td>
<td>$79.99</td>
</tr>
<tr>
<td>Battery</td>
<td>$185.95</td>
<td>$185.95</td>
</tr>
<tr>
<td>MCo Solar Cable</td>
<td>$30.68</td>
<td>$30.68</td>
</tr>
<tr>
<td>Wire/Alligator Clamp*</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Misc. Measuring Tools</td>
<td>-</td>
<td>$74.43</td>
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<tr>
<td>Total</td>
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<td>$1,078</td>
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<tr>
<td>Budget</td>
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</tbody>
</table>

* Determined by length and size based on farmer's specifications

**Alternative Solutions**
- Submersible Pump
- More expensive
- More energy
- More versatility
- Hose Size
- Less friction loss
- Greater distance and elevation change
- Water Storage
- Less simplistic
- More maintenance
- Less versatility
- More expensive
- Wind Power
- More expensive

**Impact/Sustainability**
This project was able to fulfill its goal, but it also allows for many future opportunities to grow and develop some design for every farmer and help to irrigate the world as cost effectively and practically as possible. Several different opportunities for innovative ideas and other uses of the system are possible. For example, a phone charger connected to the battery was tested and successful. This allows the battery to be transported anywhere to power several different devices, which will change how people are able to use technology in underdeveloped areas.

**Final Design**
- Solar panel charging the battery with the MC4 solar cable
- System set up for demonstration purposes

**Background**
The project’s goal was to create a system that would help farmer’s, primarily in Uganda. The focus is to irrigate one acre of land at a time, so that modifications can easily be made with growth of acreage. Simplicity and low maintenance are key components to ensure these farmers can use the system efficiently. Diesel powered pumps can be expensive and difficult for farmers to use, so the team was asked to design a solar powered option at a low cost.