

# URBAN FARMING WITH A TWIST

## PROJECT OBJECTIVES

This project aims to improve the energy efficiency of solar panels, by reducing the temperature around the solar panel with evapotranspiration from the plants, copper cooling running below the solar panels and evaporative cooling. Reduction in temperature of the solar panels is also expected to increase the lifespan of the panels.

The project also efficiently utilises space and energy resources by having the hydroponics system powered by the solar panel. By combining solar panels and hydroponic crops, this solution can be replicated to tackle land scarcity by maximising Singapore's existing space.

## PROJECT SUMMARY

The project features a hydroponics setup underneath the solar panel to reduce ambient temperature, while monitored data such as water level and temperature is collected by an Arduino. The system uses gravity assisted flow to reduce energy usage, and the flow system through the copper coils helps cool down the solar panels. The hydroponics and the copper coils also share a symbiotic relationship to cool down the solar panels. Additional features like the brushless motor fan further cool the solar panels through evaporative cooling. The loads are fully powered by the solar panel, while the battery and the charge controller are housed in a IP66 container to protect the circuit from weather conditions.

## PROJECT OUTCOMES

- Increased energy efficiency of 3.5% as compared to the solar panel setup without cooling measures.
- Concluded that plants that grew shaded by the bifacial solar panels were as healthy as the plants that grew under direct sunlight.
- Determined that data collection using ThingSpeak (Internet-of-Things analytics platform service) is viable and scalable.

## PROJECT SETUP



Hydroponics system under the solar panel, evaporative cooling at the side and a IP66 circuit box to protect the circuit from weather conditions.



Project setup at a different angle.

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PROJECT BY:

Alif Danial Bin Asnor  
Shaik Md Akasyah Bin Nizar  
Chua Ze Yuan