

A Simple Method To Improve Energy Production From Bifacial Solar Panels.

Introduction:

Solar panels are devices that convert sunlight into electrical energy through photovoltaic (PV) panels. There are two different types of solar panels. Monofacial (generates electricity on one side) and Bifacial (generates electricity on the two sides of the solar panel).

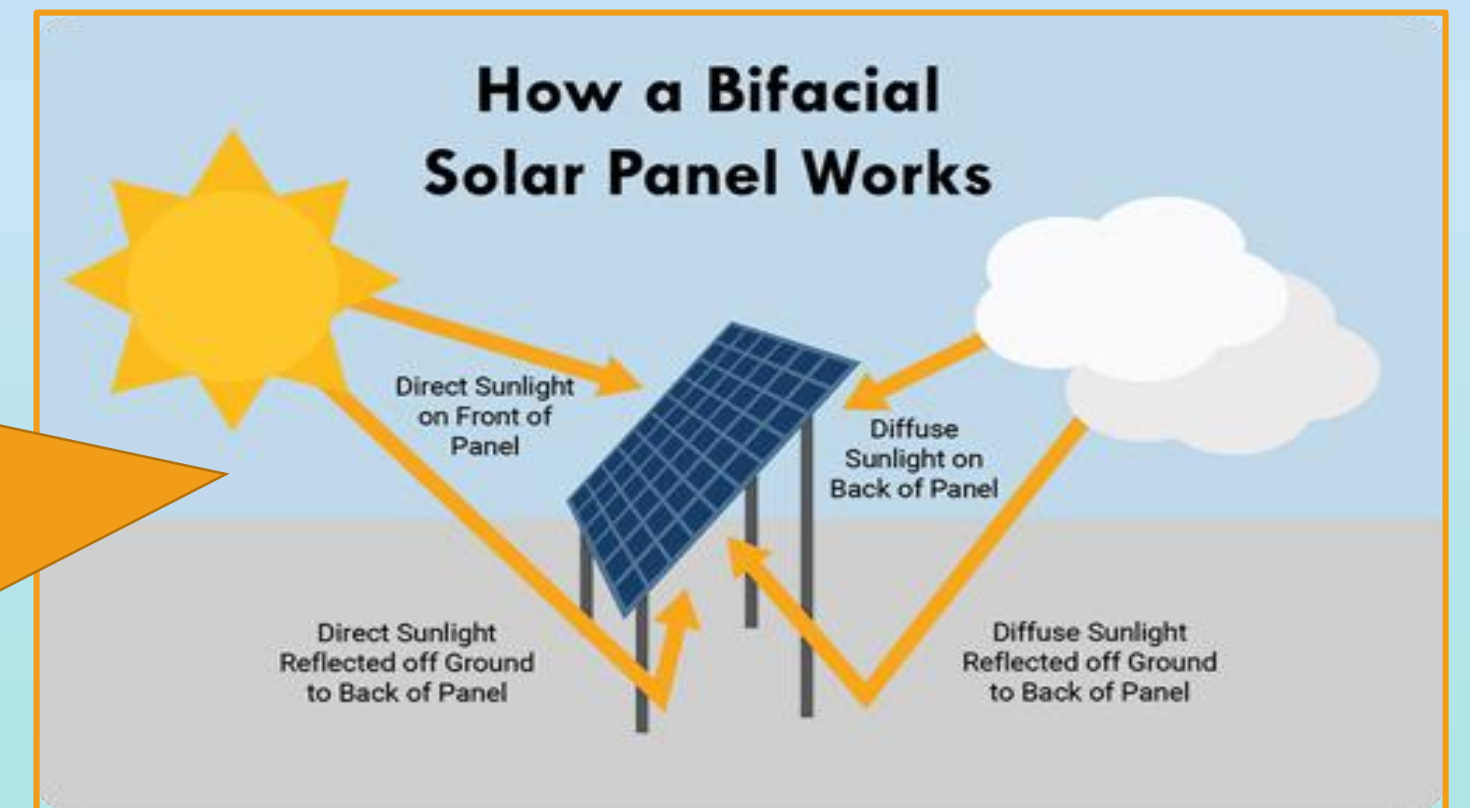
Bifacial panels can produce up to 30% more electricity than the equivalent monofacial.

A reflective surface underneath the solar panels should help to divert solar rays to the back of the panels, thereby increasing their efficiency.



Method:

Reflective foil sheets were placed under a bifacial solar panel (4m²)-(SP1) Solar Panel 1. Solar energy data was collected using TIGO Smart software. Data from the panel with the foil underneath was collected and compared to data from panels without foil and a dark tiled roof underneath – Solar Panel 2 (SP2).



Aim:
To investigate if the output of bifacial solar panels is increased by placing a reflective material underneath and if so by how much.

Results:

Fig. 1 shows the daily energy produced from each of the panels before and after the addition of the foil. Energy output varies from day to day depending on the cloud cover. Panels SP1 and SP2 produce similar amounts of energy but there are differences that are more clearly seen in Fig. 2.

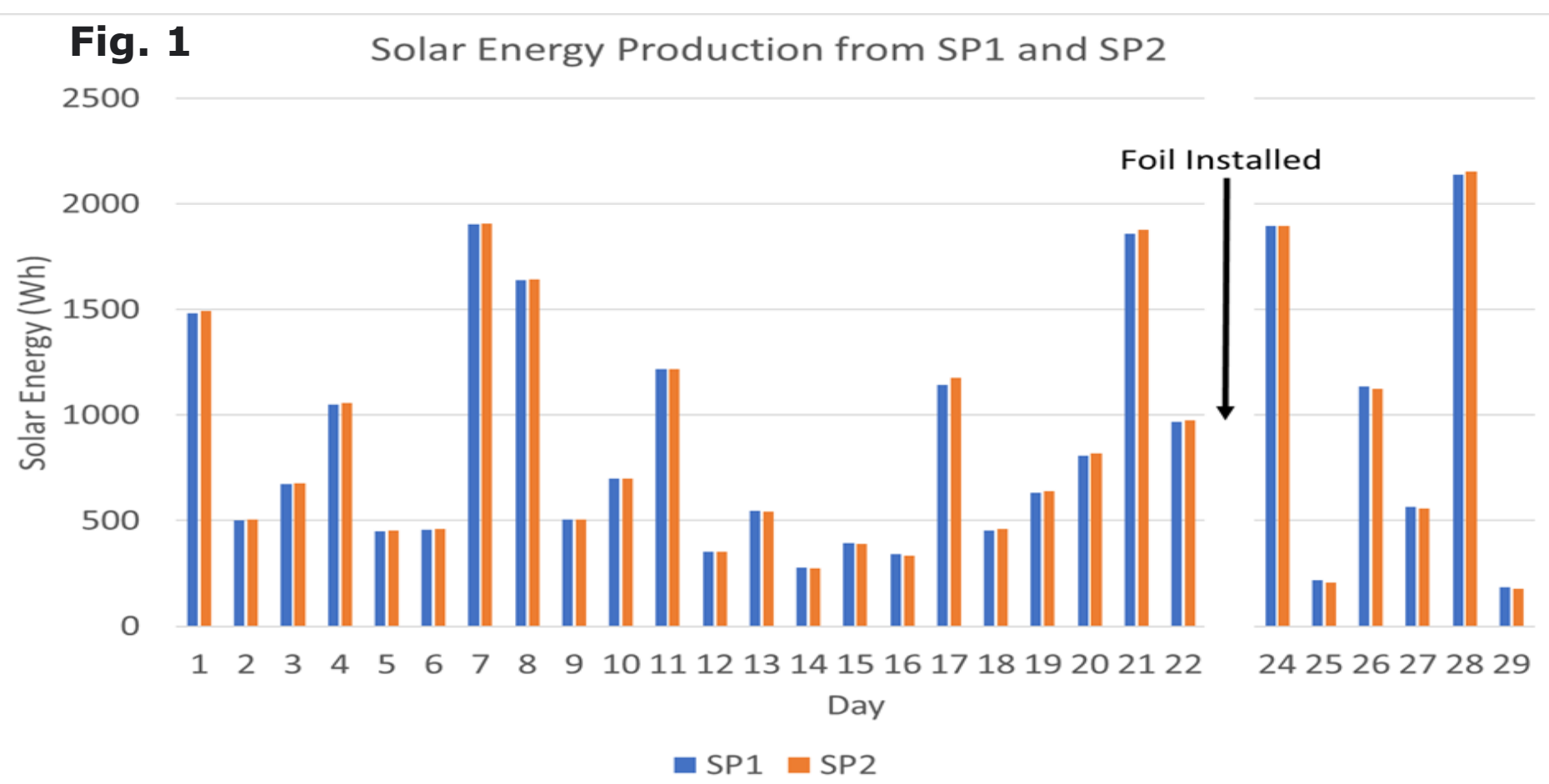
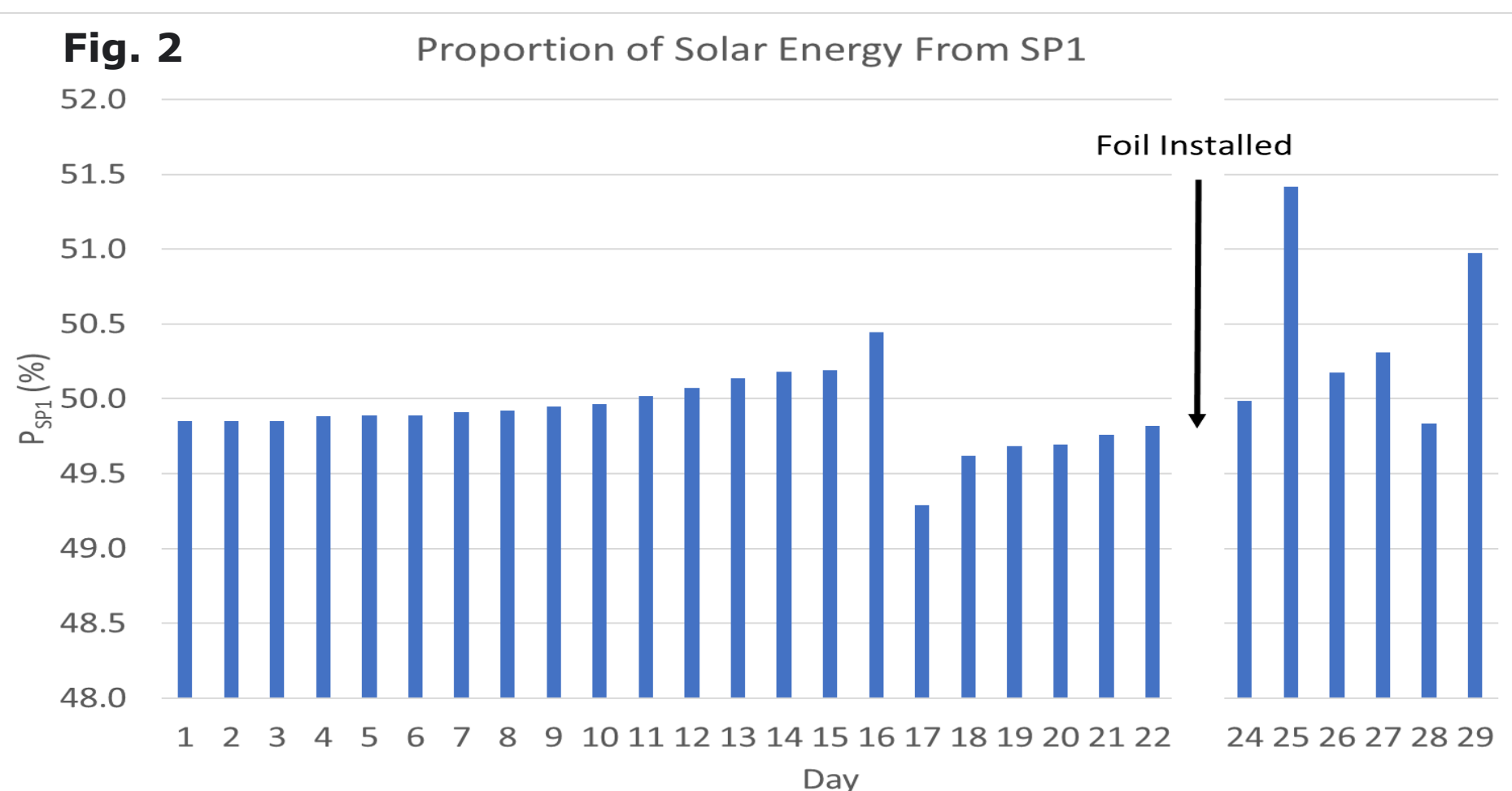
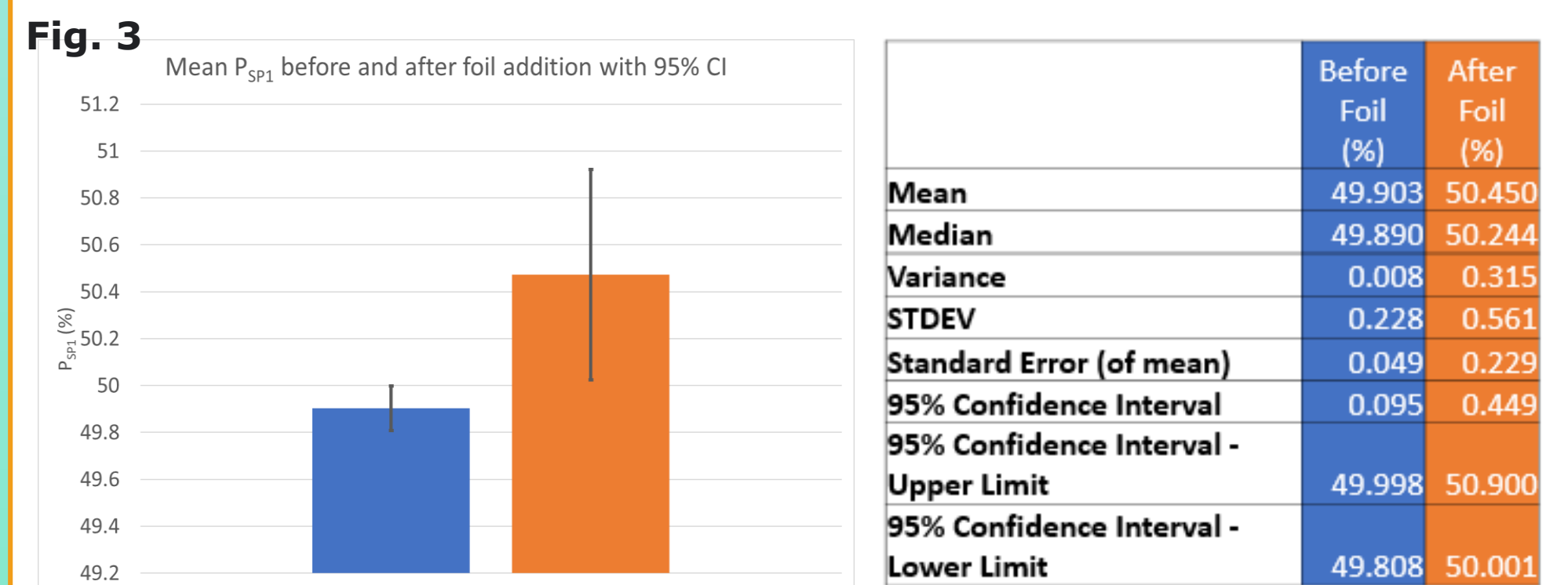


Fig. 2 shows the solar output of SP1 as a proportion of the sum of the output from the two panels. A value of 50% indicates both panels produced equal amounts of solar energy. The two days with the highest proportions occurred after the foil was added. These were days with low light levels (see Fig. 1).



Statistical Analysis:

Fig. 3 shows that the addition of foil increases the energy production by SP1. The 95% CI is represented with error bars. We can see that the lower 95% CI after foil addition is higher than the higher 95% CI before foil addition. This shows that the results are statistically significantly.



Conclusion:

- The addition of reflective material underneath bifacial solar panels increases energy production by an average of 1%.
- Solar Panel SP1 produced 688 kWh of energy in 2021, a 1% increase would equate to an additional 7 kWh of energy per annum.
- In Ireland 50,000 homes have solar panels on their roofs. Assuming that each home has 4 solar PV panels a 1% increase in energy output would correspond to 1.4 GWh of additional power.
- Reflective roofs have the added bonus of cooling the solar panels in summer, further increasing their efficiency.

Further Research:

- Investigating different reflective materials, e.g. high reflective paint.
- Extending the duration of the study to determine if there are seasonal effects.