

Fraunhofer Reports Combining Farming With Solar 186% More Efficient In Summer Of 2018

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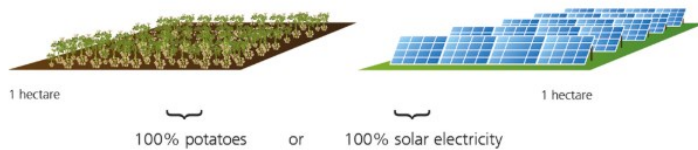
April 12th, 2019 by [Steve Hanley](#)

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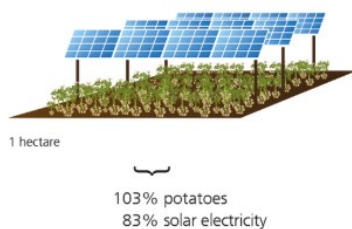


For many people, solar power is seen as a threat to farming communities. That's because they believe farmers must choose between raising crops or livestock and installing solar panels on their land. The Fraunhofer Institute has been conducting experiments in what it calls **agrophotovoltaics** for two years near Lake Constance, Germany. In the first year, it found the combination of solar and agriculture made the land 160% more productive than if it had been devoted exclusively to one or the other.

Separate Land Use on 1 Hectare Cropland: 100% Potatoes or 100% Solar Electricity



Combined Land Use on 1 Hectare Cropland: 186% Land Use Efficiency



© Fraunhofer ISE
 Through the combined land use, the land use efficiency with the APV system is 186 percent.

Agrophotovoltaics & Hot Weather

2108 was one of the hottest years yet in Europe, with the high temperatures having a negative affect on the yield from many farms. Yet Fraunhofer's Lake Constance experimental farm thrived. The shading provide by the solar panels actually increased the harvest and the extra sunshine boosted electricity output as well. "Based on the 2018 potato yield, the land use efficiency rose to 186% per hectare with the agrophotovoltaic system," says Stephan Schindele of Fraunhofer ISE in a [press release](#).

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Credit: Fraunhofer ISE

The Lake Constance farm mounts its solar panels 5 meters above the ground, leaving room for livestock and plants to grow and conventional farm equipment to operate beneath them. In comparison to open fields in the area, solar irradiation beneath the panels was about 30% less, the air temperature was identical, but soil temperatures in the spring and fall were lower.

In the hot, dry summer of 2018, the soil moisture in the wheat crop was higher than the reference field. "We can assume that the shade under the semi-transparent solar modules enabled the plants to better endure the hot and dry conditions of 2018," says the agricultural scientist Andrea Ehmann. "This result shows the potential for APV in arid regions, but also the necessity to carry out further trials in other climate regions and with other types of crops," adds her colleague Axel Weselek.

Food vs Fuel

Producing electricity on a farm has other economic benefits as well. Equipment manufacturers like Fendt and John Deere are starting to introduce **electric tractors** and other farming equipment. In combination with local battery storage, a farm can become energy independent. "When politics allow, agrophotovoltaics can provide the answer to the 'food or fuel' debate. From the technical point of view, farmers can harvest both. Through the dual use of arable land, the main task of food production is met. The additional solar electricity production contributes to the expansion of electric mobility and serves to protect the climate," Stephan Schindele says.

Potential for Arid Regions

Fraunhofer is experimenting with agrophotovoltaics in **other parts of the world**, including Chile, Vietnam, and India. A pilot study in the Indian state of Maharashtra showed that shading effects and less evaporation result in up to 40% higher yields for tomatoes and cotton crops. "In certain cases, we calculate nearly double the land use efficiency for the region," says Max Trommsdorff of Fraunhofer ISE, project leader of the study.

In a project within the EU Program Horizon 2020, the Fraunhofer researchers are working together with partners from Algeria to test the effects of agrophotovoltaic systems on the water balance. Besides less evaporation and lower temperatures, harvesting the rain water with PV modules also plays a significant role.

Costs & Benefits

What about costs? Fraunhofer ISE says its agrophotovoltaic systems cost about the same as conventional rooftop solar systems. In other words, they are more expensive to install than traditional ground mount utility scale systems, but they have so many extra economic and social benefits that the extra cost is rapidly amortized over the life of the system. The point is farmers don't have to choose between growing food and erecting solar arrays. They can do both and benefit not only themselves but society as well. More renewable energy rather than less is always a good thing.



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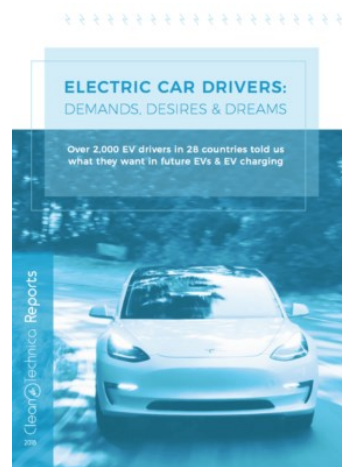
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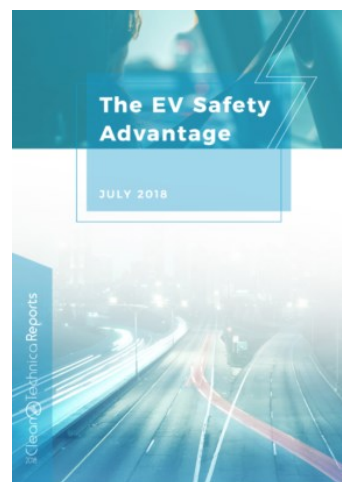


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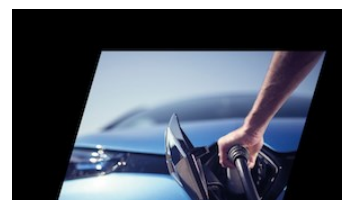
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About the Author



Steve Hanley Steve writes about the interface between technology and sustainability from his home in Rhode Island and anywhere else the Singularity may lead him. His motto is, "Life is not measured by how many breaths we take but by the number of moments that take our breath away!" You can follow him on [Google+](#) and on [Twitter](#).

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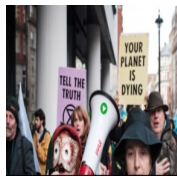
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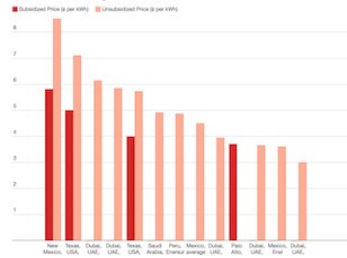
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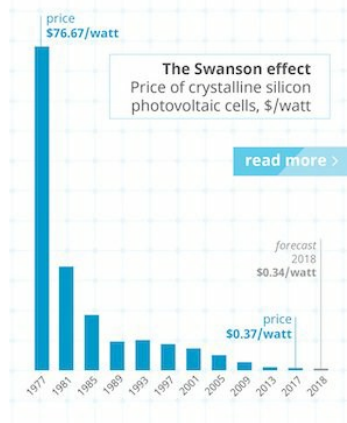
Wind & Solar Prices Beat Fossils

Low Solar Bids (2013-2016)

Prices agreed to under 20- and 25-year power purchase agreements. Note that the low bids in Texas are actually lower than the amounts mentioned in the chart... but exact figures have not been revealed.



Cost of Solar Panels Collapses



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