Environment

A tech revolution will help farmers harvest sunshine with their crops

Agrivoltaics will combine plants with power to make full use of scarce land – and give growers an extra income

By EMMA BRYCE
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Credit Nick D Burton
In the heart of the Sonoran Desert in Arizona, lush rows of tomatoes, peppers, carrots, chard and peas are growing in the arid extremes, protected by an array of solar panels which shade the crops and keep moisture in the soil.

This is one of a number of test grounds for the principle of agrivoltaics, a way of fusing food with clean-energy production that will change the way we farm in 2019.

This relatively simple technology offers a solution to two major challenges of our times: ramping up food production so we can feed 9.8 billion people by 2050, and making the switch from fossil fuels to green energy – two goals that will both require swathes of increasingly limited land. Growing crops beneath photovoltaic panels also saves water and enables food production in dry, hot regions. In 2019, with solar-panel prices predicted to dip by up to 15 per cent, according to Bloomberg New Energy Finance, agrivoltaics will become an agricultural norm.

The integration of solar panels and plants isn’t only good for crops: it could increase renewable energy production. When solar panels reach temperatures of 25°C or more, their efficiency dips. But an unexpected discovery of the Sonoran Desert projects has been that crops transpiring beneath the panels create what the project’s leader Greg Barron-Gafford, a biogeographer at the University of Arizona, calls an “evaporative cooling effect”, which chills the underside of the solar array and improves its efficiency.

Elsewhere, projects are highlighting the land-saving potential of agrivoltaics. A 2.4-hectare project in Germany called APV-RESOLA has found that combining solar panels with cropland “results in a rise in land-use efficiency of more than 60 per cent” (a measure of the total productivity of a unit of land) while maintaining 80 per cent of crop yield.

But these are just two of the several hundred agrivoltaic plants that now pepper farmland in the United States, Germany, France, China and Japan. In Japan alone, more than 1,000 agrivoltaic plants have been installed in recent years, driven by declining land space in the country.
“Just eight years back there was almost nothing globally,” says Max Trommsdorff from the Fraunhofer Institute for Solar Systems, who is project lead on APV-Resola. “Today we have approximately two gigawatts [from agrivoltaics]” – enough to power almost 1.5m homes.

Next year that figure will expand as governments catch on to the benefits of agrivoltaics. The French government says it will double the number of tenders available for agrivoltaic projects in 2019, as part of a larger renewable-energy support scheme.

And a US Department of Energy-funded project called InSPIRE is building a network from existing agrivoltaic plants, gathering data from these sites including energy output, which crops flourish beneath the panels and how much water is conserved. With 18 projects currently in the database, the project will be expanding to include projects in Puerto Rico, Indonesia and elsewhere.

“We are drastically expanding the number of research sites in 2019,” says Jordan Macknick from the US National Renewable Energy Laboratory, which is involved with the project. “We’re really hoping this could serve as the common source of data for people all over the world. I think this configuration, linking solar and agriculture, is poised to explode.”

Barron-Gafford, whose project is part of InSPIRE, thinks there’s another reason why agrivoltaics will take off in 2019: the weather extremes of 2018, which gave many countries their warmest year on record.

“If you can do something that saves water, it’s going to catch someone’s attention. If you can add a consistent income source like renewable energy, then farmers are going to like it,” he says. “The fact that we’re in such a stressful climate right now makes the idea of innovative solutions really captivating.”

*Emma Bryce is a London-based science and environmental journalist*
IT'S ME.
EARTH.

YEAH. JUST WANTED TO SAY HOW IMPRESSED I AM WITH ALL THE AGRIVOLTAIC FARMING YOU HUMANS HAVE BEEN DOING.

OH, RIGHT. THANKS.

I MEAN... WHO WOULD HAVE THOUGHT CROPS BENEATH SOLAR PANELS WOULD HAVE AN EVAPORATIVE COOLING EFFECT - HELPING INCREASE THE EFFICIENCY OF BOTH SOLAR PANELS AND CROP YIELDS?

IT'S GENIUS!

WELL.... THERE'LL BE 9.8 BILLION OF US BY 2050.

AND WE'LL ALL NEED FEEDING SOMEHOW. HAHA.

THEN THERE'S THE WHOLE SWITCHING FROM FOSSIL FUELS TO GREEN ENERGY BUSINESS...

GREG, I COULD NOT BE HAPPIER!

IN FACT, I WAS TALKING TO SUN THE OTHER DAY. SAID SHE DIDN'T THINK YOU HAD IT IN YOU.

THOUGHT YOU WERE JUST A BUNCH OF WAR-MONGERING APES.

REALLY?

YEP, SO... WELL DONE, MATE.

REALLY WELL DONE.