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# Adding Solar Panels to Farms Is Good for Plants, Animals and People

By: [Allison Troutner](#) | Dec 6, 2022



A flock of sheep graze alongside mustard plants growing beneath solar panels in Geldermalsen, Gelderland, Netherlands. This technique is known as agrivoltaics and is growing in popularity around the globe. MISCHA KEIJSER/GETTY IMAGES

Driving down an empty country road, scenes of corn fields, silos and herds of pastured cows scroll past. Typical for a rural landscape. But up ahead, something stands out. Nestled between rows of greens and other crops you see long stretches of charcoal gray rectangles angled toward the sun — [solar panels](#).

"Planting" solar panels into the middle of agricultural fields or livestock pastures sounds like an unlikely home for renewable energy. Still, **agrivoltaics** — a renewable energy approach that shares agricultural land with solar panels — is a powerful way forward in [energy innovation](#) and could help reduce agriculture's impact on [climate change](#).

Agrivoltaics might be paving the way for a brighter future.

## What Is Agrivoltaics?

Agrivoltaics brings the power of water, energy and agriculture into synergy — a mutually beneficial relationship between plants, water, soil and ... solar panels.

"Agri-" means food production and "-voltaic" means "electricity." Agrivoltaics is often abbreviated AV so that you can save your tongue the effort. It's also called agrisolar, low-impact solar or agriphotovoltaics (APV). Whichever term you prefer, it all refers to the same concept, turning active agricultural land into a dual-purpose solar farm.

"Essentially, we are farming the sun," says Ben Dritenbas, senior development project manager at [DSD Renewables](#), a solar developer and asset owner in the renewable energy industry.

Agrivoltaics didn't come around because some tech geeks thought it would be funny to put solar panels in a field with a bunch of sheep. Agriculture and food production are massive contributors to climate change. About [85 percent](#) of global water consumption is used for agricultural purposes, chief among them is irrigation. And food production is [expected to double](#) over the next three decades to meet population demands.

## Solar Energy as a Solution



The solar energy sector has experienced a boom in the last decade and now solar provides enough energy to power 18 million homes in the U.S. [OWNGARDEN/GETTY IMAGES](#)

The total global population just hit **8 billion people** and is expected to reach **9.8 billion** people by 2050. The problem is that more than **one-third** of all greenhouse gases are due to how we produce, process and package food.

Scientists, researchers and solar energy developers have been looking for ways to reduce human impact on climate change, and they've increasingly turned to solar energy. In the last 10 years, the solar industry experienced a growth spurt of teenage proportions, growing on **average of 33 percent** each year. Today, there's enough solar energy to power **18 million U.S. homes**.

But it's not a cut-and-dry solution. A widespread concern with solar panels as a significant renewable energy source is the sheer amount of land solar arrays require.

Solar power requires **10 times** as much land per unit of power, compared to fossil fuel-powered plants. The National Renewable Energy Lan (NREL) estimates that by 2030, **2 million acres** of land will be used for solar installations.

But solar panels can hog less ground by sharing space with plants and animals on agricultural land — that's only the beginning of the benefits of AV systems.

## Agrivoltaics Helps Plants and Animals

When plants are growing, they have a sunlight saturation point. It's like eating a burger until you're so stuffed that it's no longer enjoyable. Plants are the same. They can't exponentially [take in sunlight](#).

Unlimited sunlight doesn't mean crops grow faster or larger either; they sweat when they've had too much. When you sweat, you get thirsty; plants do too, which means they need more water.

But when farmers place solar panels in just the right position to allow an appropriate amount of sunlight, the plants get the sun they need *without* becoming too thirsty.

[Studies](#) from a research site in Montpellier, France, have shown that lettuce crops grown using AV were equal to — or exceeded that of — plots in full sun without an AV system *and* had a 20 percent reduction in the crops' water consumption.

In other [AV trials](#) that included solar panels among livestock, the panels provide shade so animals like sheep and cows can graze all day and still get out of the hot sun with less need for water. A team from Cornell University is even [growing wildflowers around solar panels](#) to see if it can help improve a declining bee population.

Sheep take cover under the shade of solar panels at an agrivoltaics power generation farm Lianyungang City, China.

VCG VIA GETTY IMAGES

## The Solar Panels and Farmers Benefit, Too

The benefits aren't just one-sided in this symbiotic relationship. Solar panels directly benefit from their relationship with the plants, too. This is where some real agrivoltaic magic (science) happens.

In the [hottest and most life-sucking places on Earth](#), like the Mojave Desert, solar panels don't perform well (but let's be honest, we don't perform well in heat that exceeds 120 degrees Fahrenheit [48.8 degrees Celsius] either).

When solar panels are positioned in deserts, they hold on to the heat they absorb from the barren ground below, creating a heat island effect that makes the surrounding area a lot hotter.

But plant vegetables in the ground below the panels and the plants transpire (sweat) water from their leaves, cooling the surrounding air and, ipso facto, keep the panels

cooler. The panels can perform better at cooler temperatures, turning more sunlight into electricity! Pretty cool, right?

Studies at Oregon State University found that solar panels like these with crops planted beneath were able to generate **10 percent** more electricity.

Farmers or livestock owners also reap the benefits. Unfortunately, farmers have taken a financial hit in recent years. In 2020, there was a **23 percent** increase in U.S. farm bankruptcies from the previous year. As older farmers hand over operations to children or another family member, some aren't committed to the risky idea of long-term farming as a career.

Still, AV offers a new path forward, says Ryan Lloyd, director of asset acquisition at DSD Renewables. "Many farming families are starting to get a little bit excited because it's like, well, we can still farm and have a renewable energy source on our land," he says. "They're starting to see the best of both worlds."

Agrivoltaics also offers farmers the potential for higher yields and creates an additional revenue stream by allowing them to lease their land to solar developers.

Current projects in the northeastern U.S. are experimenting with AV systems on **sheep grazing land**. "It might help lower costs for mowing and some of the operation and maintenance costs," Dritenbas says. "We fit into what the farmers are trying to do and try to coexist as best we can."

Sheep farmers can diversify their income, solar panel operators don't have to worry about mowing and sheep can eat until their heart's content.

One of the largest agrivoltaics sites in the U.S. is a blueberry farm in Rockport, Maine. Researchers from University of Maine Cooperative Extension are evaluating the impact of the installation and will also see how the crops fare under the solar array.

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## Throwing Shade on Solar and Other Challenges

People like the idea of renewable energy, but not close to their homes. Ask anyone if they support renewable energy and they'll probably say, "Of course!" Ask them if they are OK living next door to a solar installation and they're like to say, "Absolutely not."

Because solar power can't be loaded into a truck and driven to places like **fossil fuels**, sites must be close to resources, i.e., close to people. And some people are concerned that rectangular eyesores decrease property values.

"The industry calls them NIMBYs," which stands for Not In My Backyard, Dritenbas says. It's a term often used in development circles to describe residents who are less than thrilled about living next to a large solar installation, even if they understand it's for the greater good.

"We do screen the sights within landscape buffers the best that we can to meet county ordinances," Dritenbas explains. "We try and work with the landowners and adjacent landowners and try to come to a compromise, so it's a win-win for everybody."

Dritenbas points out that solar panels are discreet, unlike [wind turbines](#), which are visible from a distance and consume massive plots of land. Solar panels stand between 8 and 12 feet (2.4 and 3.6 meters) tall and are typically surrounded by a fence or vegetative screen. "I think solar has done a pretty good job blending in with the surrounding landscape," Dritenbas says.

Researchers are still working out which plants and animal relationships experience the most benefit from AV systems. [A study](#) from the University of Arizona found that crops that grow well in partial shade — like sweet potatoes, lettuce, alfalfas, kale and chard — respond best. So far, shade-resistant crops like wheat and crops grown in greenhouses have not responded well.

Scientists also are asking questions about the long-term impacts of AV on land and soil quality, what types of agreements can be designed between solar developers, cities and landowners, and how livestock and animals will interact with the technology.

"Goats climb and chew everything, so they would eat the actual wires and infrastructure," says Dritenbas. "We wouldn't promote goats."

## **A New Reason to Coexist**

Whether it's lettuce, sheep, bees or native wildflowers, it's clear that the symbiotic nature of agrivoltaics can create more energy with lower carbon emissions, decrease our water demand and increase our food production. While research is still in the early phases, Dritenbas and Lloyd know that agrivoltaic projects like theirs are pushing solar innovation forward.

"Someone's got to progress forward and see if it'll work," Dritenbas says. "We're happy to be one of those industry leaders to take that risk and try to make it happen."



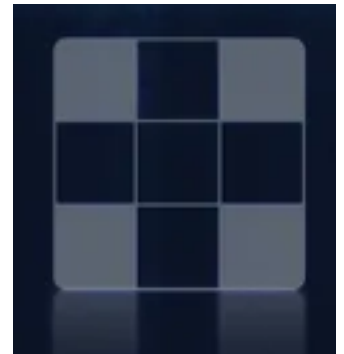
## Now That's Interesting

Agrovoltaics is only one recent innovation in a trend called "smart farming," which seeks to use the latest technologies to make farming and food production more efficient and reduce overall environmental impact.

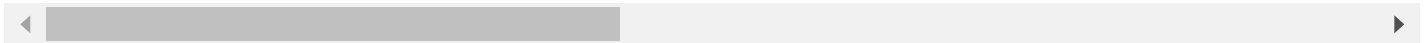
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