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Are Sheep and Plants the Future of Solar? Oberlin College Agrivoltaic Project

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Are Sheep and Plants the Future of Solar?

Oberlin College Agrivoltaic Project

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Pairing sheep or crops with solar arrays seems like an obscure combination, yet it has grown in popularity. One of the most critical aspects of transitioning to clean energy is boosting solar generation capacity. Yet, solar arrays take up a lot of land space. Five to ten acres of land is required for just one megawatt of solar power. This creates a land-use conflict between solar developers and farmers, as farmers are concerned that the increase in solar popularity will detract from their farmland. The Sierra Club, a grassroots environmental organization in the United States, published an article by Jordan Thompson about the advantages of agrivoltaics. He wrote, "Renewable energy has often been at odds with agriculture, but recent research projects and experiments demonstrate that combining the two industries is worthwhile." Whether crops or grazing land, agrivoltaics fosters a symbiotic relationship between solar arrays and agriculture and solves the land-use conflict. This practice promotes a healthy landscape, increases environmental benefits, and boosts rural farmland economies with solar arrays.

Solar and Crops

The first form of agrivoltaics involves planting crops directly underneath solar modules or between rows. While it may seem like the crops would interfere with energy generation from the solar array, the presence of plants beneath the array increases solar performance. Benefits for solar generation come from the plant's ability to lower the modules' temperature and reduce levels of dust and soiling on the solar modules.

The crops themselves also benefit from this partnership between solar and agriculture. Shade helps some crops by optimizing the amount of sunlight that plants get, keeping the plants cool, and reducing evaporation. Shading also increases soil moisture, which, in effect, reduces water use on the land by 29 percent. Additionally, the solar modules reduce wind speed over crops and guard them from extreme wind conditions.

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Furthermore, agricultural land is better for developing solar, making this partnership much more accessible to incorporate into mainstream farming practices. This is because agricultural land is previously tilled, eliminating the need to flatten the land before laying down solar. Solar developers have also deemed This previously tilled land less risky, as it requires less testing to see if the site is suitable for use. Additionally, since agricultural land is already in use when solar developers propose to install panels, there is a reduced risk of challenges in the environmental review and permitting process — making it easier for solar to be installed on a farm than an empty plot of land.

In a time when family farms are facing increasing economic challenges, using farmland for multiple uses is an opportunity for farmers to increase their income. By using crops and solar energy as sources of income, farmers will have a diversified revenue base and more resilience in their livelihood. When farmers have more than one source as an income stream, a drop in demand for one source will not have as significant of an impact on their overall livelihood because they have other sources of income supporting them. Additionally, all of the protection for plants from the solar array means there is the potential for farmers to extend growing seasons, providing the opportunity for even more income.

Solar and Grazing

Solar grazing is the second form of agrivoltaics. This is when sheep graze the grass under solar arrays, keeping vegetation at an optimal height without using carbon-emitting machinery. This prevents the grass from growing too tall and blocking the solar modules. Sheep are a perfect choice for this role, chosen above other grazing animals for a few reasons. They are shorter than cows and horses so that they won't bump into or damage modules and will not chew on wires like goats might.

For the owner of the solar array, there are benefits to relying on these adorable animals. The operation and maintenance costs of a solar array being tended to by sheep are significantly reduced. Using livestock to graze under arrays is often 30 percent cheaper than traditional landscape management. There are also reduced mowing risks — sheep do not carry the risk of sparking and damaging the array like mowers do.

There are also benefits for the farmers who own sheep. Like crops, the diversification of farm income leads to increased resilience, which is especially important when farmers face economic stress. Partnering with solar farms also provides the opportunity for expanded operations.

Overall, the United States would benefit from solar grazing practices—currently, the U.S. imports more than half of sheep products, including meat and wool. With more grazing opportunities, more farmers will be incentivized to maintain herds of sheep. This will bring greater opportunities to produce meat, dairy, and wool, all while boosting local economies and allowing people to purchase these products locally, avoiding importing costs and emissions.

Finally, having sheep on-site benefits environmental conditions. While the sheep graze, they trample waste and old plant matter into the earth, decomposing and acting as a fertilizer, boosting soil health. Another environmental benefit is that the practice of grazing sheep discourages the use of pesticides on the site to keep the sheep safe, decreasing risk of environmental harm.

Oberlin Agrivoltaics Project

As these shared solar and agriculture practices gain traction among solar developers and farmers, Oberlin College is jumping on the agrivoltaics train. In March 2023, the College partnered with Old Slate Farm, a sheep and flower farm in Mount Vernon, Ohio. This partnership to jumpstart an agrivoltaics project on campus for Oberlin's solar array had been in the works for months by then, ironing out details about the scope of the work. These logistics included when the sheep would arrive, how long they would stay, how many sheep would come, and where to get water for them. There is also an active construction site near Oberlin's solar array to build a geothermal wellfield, so ensuring the sheep and human visitors could stay safe was essential in developing this partnership. Through this partnership, the 2.27 MW solar array among North Fields in Oberlin, which has been allocated 12 acres, now gets sheep visitors a few times a year. The sheep come in May, August, and October for two to three weeks to graze beneath the array, maintaining the grass. This practice will decrease the amount of fuel Oberlin uses to maintain the solar array, traditionally kept up by diesel mowers and two-stroke weedeaters, both of which emit dangerous pollutants. In addition to being more environmentally friendly, sheep exceed the abilities of traditional mowing practices. In an email, Joel Baetens, Campus Energy & Resource Manager at the Oberlin College Office of Energy and Sustainability, wrote, "I was happy to hear from our maintenance manager that the sheep did a better job around the edges than a person could do with a weed eater!"

This partnership continues to evolve as Oberlin discovers new ways to make the field more welcoming to the sheep from Old Slate Farm. For example, Oberlin has planted the field with different seeds, including white clover seed, to make the field more nutritious for the sheep.

Combining the solar array land with sheep grazing also increases the productivity of the land, using College land and resources more efficiently. In addition, the reduced maintenance costs generate positive public perception around renewable energy projects and make them more attractive financially, ultimately allowing for more renewable energy projects to be built. Overall, the agrivoltaics project has contributed to Oberlin's carbon neutrality goals by 2025.

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Oberlin College students and Oberlin community members can visit the array in person to see this innovative agricultural practice for themselves. Prospect Street has a public path where people can access the array. While the sheep are only there for a few weeks across the year, the array is still welcome for visitors to admire year-round.