SHARING SPACE

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AGRIVOLTAICS Enable Grid-Scale Solar and Farming to Use SAME ACREAGE

One of the concerns about grid-scale solar installations is the potential loss of farmland. Agrivoltaics addresses that concern by using the same land for solar development and agriculture. An added benefit is that the land can be returned to farming at the end of the solar facility's useful life.

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Editor's note: *This is the latest article in a series designed to inform municipal officials and employees about grid-scale solar projects. PSATS has partnered with the state Department of Environmental Protection (DEP) to provide these educational opportunities.*

Several forces are driving the need to expand electricity generation in the United States, from housing to data center development. Consequently, Pennsylvania is seeing a sharp rise in proposed grid-scale solar development (GSSD).

One of the concerns with large solar facilities is loss of farmland, as agricultural lands often meet the ideal criteria for solar development. Developers are addressing this concern through agrivoltaics, which is a dual land use model that allows simultaneous energy and crop production on the same acreage. It can allow farmers to preserve agricultural profitability of their land while providing a consistent, long-term income stream through leasing the land for electricity production.

Solar power generation is land intensive, requiring on average about six acres of relatively flat land per megawatt of electricity produced. Although solar developers do not specifically seek out agricultural land, its large, flat, adjoining parcels are attractive to all kinds of development, including solar.

As large solar facilities are proposed for more locations in Pennsylvania, communities are often concerned not only about the loss of farmland but also the rural character associated with agriculture. Agrivoltaics is seen as a way to hold on to the land's agricultural capacity and enable it to return to purely agricultural use once a solar site is decommissioned at the end of its useful life. This is different from other types of development, such as single-family housing or distribution centers, which permanently alter the landscape and make a return to agricultural use difficult.

More than half of respondents to a 2024 U.S. Department of Energy survey of people living within three miles of a grid-scale solar facility said they agree or strongly agree that they would prefer the integration of grazing or crop production if another solar project were sited in their community.

How agrivoltaics works

There are three main ways that land housing large solar installations can be used for agriculture: grazing, horticulture, and conventional crop production.

Grazing — In solar grazing, animals — most commonly sheep — graze a large solar site to control vegetation, rather than mowing the site. Grazing occurs about as frequently each season as would mowing.

The solar company normally pays the grazing operator annually on a per-acre basis. Large solar facility owners in the eastern U.S. have found this to be one of the most economical methods to provide the required vegetation management, while also creating the potential for a profitable agricultural business for the farmer managing the same acreage.

Sheep will eat many kinds of perennial vegetation. Botanists are developing new seed mixes to plant specifically for agrivoltaic grazing. Some mixes are also designed to attract pollinators, such as bees and butterflies. More information is available from the American Solar Grazing Association at www.solargrazing.org.

Horticulture — Researchers are testing various high-value horticultural crops for suitability to grow beneath solar panels and between panel rows. They are also evaluating the best density for planting, optimal management plans, and equipment needs. This setup requires less water than conventional agriculture because the panels shade much of the field.

Growing horticultural crops on solar facility land requires a fair amount of labor, so it is probably more realistic for smaller sites — comprising tens of acres, rather than hundreds — that are becoming more common in Pennsylvania.

Conventional crops — Some farmers hope to produce such crops as soybeans, small grains, and hay, which have an established market, on these lands. Perennial hay crops, with their low-growing nature, help with stormwater management year-round. Hay is versatile because it can be mowed, grazed, or harvested.

Farm equipment companies are adapting machinery to operate in these tighter spaces. Single-axis tracker solar panels move throughout the day to

Farmer Brittany Staie, left, of Sprout City Farms and farm manager at Jack's Solar Garden in Longmont, Colo., and farmer Kailey Littlehorn of Sprout City Farms harvest beans, just one of many types of produce that grow at the farm. Jack's is a 1.2-MW, five-acre community solar farm and the largest agrivoltaic research project in the U.S. ***(Photo by Werner Slocum for NREL.)***

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follow the sun and maximize power output. In some cases, these panels can be temporarily set near or at vertical while machinery passes between them. In some eastern U.S. locations, companies are experimenting with farming landowners to place GSS panels farther apart or on higher racks to allow harvesting using conventional equipment.

Some companies are evaluating the use of solar facility lands for manure injection.

Generating energy while preserving farmland

Agrivoltaics represents an important way to find common ground in rural America. This dual land use offers opportunities for renewable energy production while also preserving farmland. All other types of land development are considered terminal uses, unlikely to revert to farming. Agrivoltaics leaves open that possibility.

Municipal officials can help preserve the rural nature of their communities by learning about the requirements for agrivoltaics and incorporating these points as needed in their solar ordinances. We will address this topic in our next article. ✦

Farmer Brittany Staie plants produce and checks irrigation lines near the solar panels at the Photovoltaic Central Array Testing Site. The garden is being planted as a study on agrivoltaics, which allows both the solar panels and crops to benefit because they help each other perform better. ***(Photo by Werner Slocum for NREL.)***

To learn more, email Tom Murphy, PSATS' solar program educator, at tmurphy@psats.org, or call PSATS at 717-763-0930. Additional resources can be found in the *Municipal Officials' Guide to Grid- Scale Solar Development in Pennsylvania* at **www.marcellus.psu.edu/solar.**