

Instead of competing for land, some farmers and solar developers want to work side by side

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Agrivoltaics pilot plant at Heggelbach Farm in Germany. Credit: Wikimedia Commons [Tobi Kellner](#). [Creative Commons Attribution-Share Alike 4.0 International license](#).

Matt Riggs' family has been farming in Urbana since 1874. But, his parents had to work second jobs to cushion themselves from the volatile

corn and soybean markets that dominate Illinois' agricultural sector.

In the past few years, Riggs has realized the land his family has worked for 150 years is also ideal for solar panels. It's flat, well-drained and gets lots of sunlight.

As Illinois strives to convert 40% of its energy consumption to renewables by 2030 and 100% by 2050, solar installations are expected to increase by 1,700% over the next five years, according to the Solar Energy Industries Association.

Across the country, approximately 83% of new solar projects developed by 2040 will be installed on farm and ranch land, according to a 2022 American Farmland Trust analysis.

But, broad, low-lying solar arrays are not inherently compatible with farming. They typically take land out of agricultural production. This doesn't have to be the case, however. An emerging field called agrivoltaics suggests shorter, shade-tolerant crops may grow well in the small spaces between panels.

After installing solar panels at his brewery and seeing how reliable they were, Riggs wondered if he could use them to hedge his farm's balance sheet.

"The sun is going to come up on average a certain amount of time so you can build a really stable, predictable financial model, which I looked at having grown up on a farm and was like 'Wow, that's awesome,'" said Riggs.

Some Google searches led him to agrivoltaics.

While there are very few agrivoltaic projects in Illinois, early research

and small projects show synergies between [solar energy](#) and agriculture. The co-location of solar panels and agriculture could keep farmers in business, improve ecosystem health, feed the country and provide clean energy.

Learning to speak the same language

Agrivoltaics is a meeting of the minds between two groups that don't always look at the land the same way. This was on display at a recent farmer forum.

"He became bilingual and now speaks nature as well as technology," said Will Harris, a cattleman from southwest Georgia, of a developer he partnered with to graze sheep beneath solar panels.

Riggs also received a roar of laughter and scoffs during the forum when he said a developer he had considered partnering with last year wouldn't give him first right of refusal on vegetation mowing and trimming plans.

Riggs said he immediately stopped talking to the company, in disbelief that anyone would suggest they knew what was best for his family's land.

"You could offer me a trillion dollars an acre per year. There's no scenario where me or my family would feel comfortable signing the contract," he said.

One of the few Illinois farmers who still owns his farmland, he's passionate about maintaining control and is holding out for the right developer. But, many farmers don't have this luxury.

Approximately 70% of farmland in Illinois is rented from landowners who often live in cities or out of state. When solar developers approach with decades-long contracts that pay double or triple the going rate per

acre, it's hard for landowners to turn down the offers. A farmer whose yearly income is subject to fluctuating market demand can't compete.

But, if farmers and solar companies can find a way to understand each other, a growing number of farmers like Riggs see solar energy as a potential safety net. They could make a passive income from the solar company leases while still raising products for the market.

Opportunities and challenges

The logo for the Solar Farm Summit hosted in Chicago—a sheep overlaid on solar panels—is emblematic of the work that must still be done for agrivoltaics to take off in Illinois.

Sheep and solar panels pair well together. The sheep appreciate the shade from the panels and do a good job keeping the grasses low. But, there aren't many sheep farmers in Illinois, and there isn't a large appetite for lamb products in the United States.

Still, registration more than doubled at this July's summit compared with the inaugural one last year, organizers said.

On a 54-acre property called Solar Farm 2.0 in Champaign, University of Illinois researchers are exploring how row crops, which monopolize Illinois' agricultural output, can coexist alongside solar panels.

Their preliminary research suggests corn, which needs lots of sun and grows high, won't do well among solar arrays. But, shorter, more shade-tolerant crops such as soybeans, wheat, barley and hay may grow well in the small spaces between panels. In other parts of the country such as Arizona and Massachusetts, agrivoltaic farms are seeing promising yields of specialty groups such as tomatoes, basil and berries.

In Saline County, 165 miles south of Solar Farm 2.0, the American Farmland Trust has partnered with solar developer Sol Systems to see if kernza, a hybrid wheat that improves soil health, might also grow well alongside solar panels in Illinois. However, as with sheep, there isn't a large demand for kernza among American consumers.

Environmentalists have long questioned whether Illinois should be growing so much corn and soybeans in the first place. They're water-intensive, primarily used for biofuels and livestock feed rather than human consumption, and monocropping has degraded soil health, according to a study published by the National Academy of Sciences.

"You have food deserts all over the Midwest where farmers markets are about the only thing going in terms of getting produce there. Is there a way for us to rebuild some specialty crop supply at scale?" posed Ethan Winter, director of the American Farmland Trust's Smart Solar division. The 12-person team only came about three years ago to explore the intersection of solar and agriculture. This is new territory.

The passive income stream from solar arrays could give Illinois farmers the cushioning they need to diversify their harvests.

"For us to nurture this thing and grow it, it won't deliver massive profits in year one. We may fall on our faces as we're establishing these crops that are foreign to central Illinois," said Riggs, who is interested in experimenting with more direct-to-consumer products such as berries and flowers. "The cool thing is agrivoltaics can mitigate that risk until we're good at it."

Agrivoltaics is also being pitched as a way to make farming more resilient to [climate change](#). The solar panels could shield crops from the sun and storms as weather becomes more severe.

"As the climate changes, where we may have [extreme heat](#) and extreme precipitation, it may actually benefit plants to have some shade. So, it's also very forward-looking research," said Madhu Khanna, director of the University of Illinois research project.

Slowly warming up to solar

Many Illinois farmers are on the defensive as they watch utility-scale, non-agrivoltaic solar projects pop up next to their fields.

Last year, Illinois passed a zoning law that made any land approved for agricultural or industrial use also eligible for [solar installations](#).

Farmers have already had to adapt to an influx of windmills and raised concerns about carbon sequestration in recent years.

"It just seems like people are wanting to start a war right here in central Illinois over all of this green energy stuff," said Shane Gray, a first-generation farmer in Waverly, Illinois, whose farm is next to Double Black Diamond. At 4,100 acres, it's the largest solar project east of the Mississippi and is expected to offset 70% of the electricity from the city of Chicago's municipal operations.

The land was chosen because it's near a [transmission line](#), said Matt Birchby, president and co-founder of the project developer, Swift Current Energy. While he said the company is open to incorporating agrivoltaics into future plans, nothing will be farmed on this site, which is about the size of 11 family farms.

"If you're a landowner within a certain radius of a transmission line, you're either getting a letter in the mail or a knock on the door," said Alan Bailey, the Midwest solar specialist at American Farmland Trust.

The Illinois Farm Bureau, which represents three of every four farmers in the state, is against putting solar projects on productive farmland. It advocates for placing them on abandoned brownfield sites, vacant lots and rooftops instead.

But, projects on brownfields and former landfills tend to be smaller and more expensive because of land remediation costs, according to Anna Toenjes, associate vice president of impact at Sol Systems, a solar company experimenting with agrivoltaics in Illinois.

"Having the flexibility to develop projects on different types of land is really critical to achieving the scale needed to achieve the goals set on the federal and state levels," Toenjes said.

Although [solar panels](#) are only projected to cover 1% of total farmland in the United States, the most productive farmland is most likely to be affected, according to the American Farmland Trust analysis.

Historically, towns and cities were built next to the richest farmland. Transmission lines, which solar arrays must connect to, were subsequently built next to these highly populated areas, said the organization's President and CEO John Piotti.

However, agrivoltaics is slowly catching on in rural Illinois. Earlier this month, Riggs' county Farm Bureau sent his proposal to modify the organization's hardline stance against solar development to the state-level resolution committee. If approved, the Illinois Farm Bureau would support public funding for agrivoltaic projects.

Policy will set the pace

Ultimately, state and [federal policy](#) will set the pace of progress for agrivoltaics.

Lightstar Renewables, a Boston-based solar developer, applied last month to construct Illinois' largest commercial agrivoltaic project in Kane County.

The fate of the 4.95 megawatt, 36-acre project, which is anticipated to provide enough energy to power 1,100 homes annually and grow hay and soybeans, is in the hands of the state government.

The company found an interested landowner near a transmission line, worked with a local farmer to design an array he can grow beneath and between and successfully pushed the project through the county permitting process.

Now, Lightstar is waiting to be accepted into Illinois Shines, a state-run solar incentive program that can cover up to 40% of the cost of a solar system.

The program receives more applications than grid capacity, even after being allocated more megawatts under the Pritzker administration's 2021 Climate and Equitable Jobs Act.

"We anticipate it will be slow to actually get built and put into operation because of the timeline and capacity limits with Illinois Shines," said Cecelia Stephens, a development manager at Lightstar.

While hopeful the Kane County project will be approved this year, the company plans to apply again in 2025 if it isn't.

Illinois Shines is generally regarded as a national model of how states can support solar development, but Stephens said there is an opportunity for more weight to be given to agrivoltaic projects.

Applications are evaluated with a points-based system. Currently,

agrivoltaics only receives one point. For comparison, projects built on rooftops receive three points and projects built on brownfields receive two.

"If the Illinois Shines program could further incentivize or prioritize agrivoltatic projects, I think that would really be something that would help push us forward more quickly," said Stephens.

She pointed to New York as an example of a state that has really invested in the new field. It just announced a grant program that will award up to \$750,000 to agrivoltaic projects.

Riggs would like to see Illinois Shines' points-based system broken down even further to prioritize projects that will produce the highest agricultural output and create the most farming jobs.

Given that solar farm leases typically last two to four decades, he feels an urgency to get agrivoltaic projects underway.

"Every day we don't have a tiered incentive structure to incentivize real, robust dual-use, there's another project going in that's going to be there for 25 years, and it's a missed opportunity," he said.

The U.S. Department of Energy and Department of Agriculture have put tens of millions of dollars into agrivoltaic research.

There is also bipartisan support in Congress for further research into agrivoltaics. The Farm Bill introduced by House Republicans this May directs the agriculture department to study the impacts of and best practices for "shared solar energy and agricultural production." Additionally, it tells the agriculture department not to fund any solar projects on prime farmland unless they incorporate agrivoltaics or have local government approval.

"The rise of agrivoltaics is a great reason why we need a new Farm Bill every five years," said Samantha Levy, conservation and climate policy manager at American Farmland Trust.

Agrivoltaics was only beginning to be discussed in 2018, so it was not included in the last Farm Bill, which reached its five-year expiration date last year. After failing to come to a consensus, a divided Congress opted to extend the 2018 Farm Bill until this September.

History suggests Congress will likely be in gridlock until after the presidential election in November and consequently extend the 2018 bill another year.

With these federal delays and the backlogs at the state level, Riggs worries that family farmers will lose out on an opportunity to be a part of the clean energy transition and maintain their cherished livelihoods.

"If a [project](#) has real agricultural dual-use and was partnered with a small family farm, it's the golden ticket for that family," said Riggs. "Every one of these little community solar projects could literally sustain a family farm for the next generation."

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