RENEWABLE ENERGY IN ILLINOIS: THE AGRIVOLTAICS CONTRIBUTION

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I. INTRODUCTION

Endowed with rich soil, abundant sunlight, and consistent precipitation, Illinois has long been one of the leading corn and soybean-producing states.[1] With its abundant crop production, it is no surprise that the state's primary renewable energy is biofuels, with an annual production capacity of 192 million gallons of biodiesel and 1.7 billion gallons of ethanol.[2] It also generates significant quantities of wind, solar, and nuclear energy.[3] Looking toward the future, Illinois' renewable portfolio standards (RPS) have set goals for 100% clean energy by the year 2050.[4] The RPS goals raise questions of where future renewable energy facilities will be built. With almost 75% of the land area in Illinois consisting of farmland,[5] the push for expanded renewable energy production introduces some important considerations

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1 *Illinois Farmland is the Envy of the World—We Had Better Protect It*, CHI. SUN-TIMES (Aug. 8, 2019, 6:08 PM), https://chicago.suntimes.com/2019/8/8/20759238/illinois-farmland-envy-world-protect-it-soil; *Feed Grains Sector at a Glance,* USDA, https://www.ers.usda.gov/topics/crops/corn-and-other-feed-grains/feed-grains-sector-at-a-glance/#:~:text=Iowa%20and%20Illinois%2C%20the%20top,third%20of%20the%20U.S.%20crop (last updated Dec. 21, 2023); Joanie Stiers, *Illinois Corn Facts and Stats*, ILL. FARM BUREAU PARTNERS (May 17, 2022), https://ilfbpartners.com/farm/illinois-corn-facts-and-stats/; *The Crops We Grow*, ILL. FARM BUREAU, http://ilfb.org/resources/learn-about-il-agriculture/what-we-grow-and-raise-the-illinois-supply-chain/the-crops-we-grow/ (last visited Mar. 26, 2024).

2 *Illinois State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN. (Aug. 17, 2023), https://www.eia.gov/state/analysis.php?sid=IL.

3 *Id.* In 2022, Illinois was ranked fifth in the U.S. for utility-scale wind power capacity. *Id.* Illinois is also ranked fifteenth in the nation for total installed solar capacity. *Illinois Solar*, SEIA, https://www.seia.org/state-solar-policy/illinois-solar (last visited Mar. 11, 2024).

4 220 ILL. COMP. STAT. 5/8-512 (a)(6) (2021).

5 *Facts About Illinois Agriculture,* ILL. DEP'T AGRIC., https://agr.illinois.gov/about/facts-about-illinois-agriculture.html (last visited Mar. 26, 2024).

regarding the potential conversion of the state's highly productive land resources.

The transition of farmland away from food production is hardly a new concern.[6] The growth of suburban areas has the potential to convert 363,400 acres of farmland to housing and other built infrastructure in Illinois.[7] Similarly, the food commodity price spikes that struck the world in the early and mid-2000s[8] generated significant opposition to policies that incentivized biofuels and the diversion of substantial quantities of corn from animal feed to ethanol production.[9] After a period of relative calm, the invasion of Ukraine by Russia and the resulting price instability in the grain markets rekindled the "Food vs. Fuel" debate.[10]

Widespread development of wind energy projects experienced similar public perception challenges when sited on productive farmland.[11] Initial concerns regarding the colocation of wind energy and agriculture have faded as farmers adapted production methods and realized a financial safety net through long-term energy production contracts.[12] Nonetheless, many local

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6 *See* Sarah Mock, *Chapter 1: Is the U.S. Running Out of Farmland?*, AMBROOK RSCH. (Jan. 31, 2024), https://ambrook.com/research/podcast/chapter-1-the-only-thing-that-lasts-farmland-disappearing.

7 Mitch Hunter et al., *Farms Under Threat 2040 Choosing an Abundant Future*, AM. FARMLAND TR. 1, 56 (2022), available at https://farmlandinfo.org/wp-content/uploads/sites/2/2022/08/AFTFUT_Abundant-Future-7_29_22-WEB.pdf; *Farms Under Threat 2040*, AM. FARMLAND TR., https://development2040.farmland.org/ (last visited Mar. 26, 2024).

8 Ronald Trostle, *Why Another Food Commodity Price Spike?*, USDA (Sept. 1, 2011), https://www.ers.usda.gov/amber-waves/2011/september/commodity-price-spike/.

9 Joseph Glauber & Charlotte Hebebrand, *Food versus Fuel v2.0: Biofuel policies and the current food crisis*, INT'L FOOD POL'Y RSCH. INST. (Apr. 11, 2023), https://www.ifpri.org/blog/food-versus-fuel-v20-biofuel-policies-and-current-food-crisis.

10 *Id*. The U.S. public has a generally positive opinion of biofuel production. Qiankun Zhao et al., *How do the research and public communities view biofuel development?*, 133 RENEWABLE & SUSTAINABLE ENERGY REV. 110265 (2020) (manuscript at 25) (on file with Elsevier), available at https://doi.org/10.1016/j.rser.2020.110265. A study showed negative sentiments, however, focused on fraud in biofuel tax credit programs and unintended impacts on production, like changes in crop prices. *Id.* (manuscript at 26). The unintended consequences of diverting land out of traditional agriculture production is a common concern with land use change. *Id.*

11 *See, e.g.*, Jackie Smith & Patricia Alvord, *Whitmer wants to make Michigan a clean energy haven. But rural communities are pushing back*, PORT HURON TIMES HERALD (June 4, 2023, 5:05 AM), https://www.thetimesherald.com/story/money/business/2023/06/04/rise-of-wind-solar-farms-prompts-major-rule-changes-for-michigan-townships/70277865007/. For example, Michigan Citizens for Protection of Farmland was working on a ballot proposal to "ban large-scale solar farms in rural areas across the state" to "prevent future developments and protect farmland." *Id.* This comes at a time when townships in Livingston County, Michigan, are imposing moratoriums on solar and wind development. *Id.*

12 Elizabeth Weise, *Wind energy gives American farmers a new crop to sell in tough times*, USA TODAY (Feb. 20, 2020, 12:08 PM), https://www.usatoday.com/story/news/nation/2020/02/16/wind-energy-can-help-american-farmers-earn-money-avoid-bankruptcy/4695670002/. In addition to farm income, wind energy can create jobs and provide extra revenue to communities with installed wind power. *Advantages and Challenges of Wing Energy*, OFF. ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy (last visited Mar. 26, 2024).

governments have enacted community bans on wind energy under the rationale of preserving agricultural land.[13] Some ordinances limit the size of projects, require a special permit, or have broader limitations, such as setback distances.[14] Interestingly, Bessette and Mills found wind contention to decrease in communities with "higher proportions of production-focused landowners."[15]

On the other hand, the study found communities with higher natural amenities, using the USDA Natural Amenity Index, take a more contentious stance on wind farm proposals.[16] The Bessette and Mills study seems to contradict stated concerns over farmland productivity loss and demonstrates the importance of addressing community connections to the rural landscape and considering aesthetic values in energy development projects.[17] A California case study found similar contrasts between community concerns and farmer support in the solar energy context.[18] Through stakeholder interviews, researchers identified concerns related to visual and ecological landscape impacts, the difficulty of reverting land back to agriculture after solar development, and financial risks.[19] Consistent with the Bessette and Mills research, farmers and ranchers with agriculture as a primary income source expressed more support for hosting utility-scale solar than their counterparts who were not dependent on agriculture.[20]

In Illinois, an aggressive RPS, coupled with robust incentives for expanding solar energy development,[21] has elevated public concern about the

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13 *See* MATTHEW EISENSON, SABIN CTR. CLIMATE CHANGE L., OPPOSITION TO RENEWABLE ENERGY FACILITIES IN THE UNITED STATES: MAY 2023 EDITION 1 (2023). For example, in Vermillion County, Indiana, there was a 2021 ordinance that limited the size of wind projects in agriculturally zoned districts. *Id.* at 40. In Hamilton County, Indiana, "commercial solar projects are prohibited on prime agricultural soils." *Id.* at 42. In the Canovia Township (Muskegon County) and Almer Township (Tuscola County) of Michigan, an ordinance adopted in 2019 and 2020 respectively, restricted wind turbines with property line setbacks and limits to noise and flickering which "explicitly references agricultural preservation as well as health and safety concerns as the basis for the restrictions." *Id.* at 88-90.

14 *Id*. at 1.

15 Douglas L. Bessette & Sarah B. Mills, *Farmers v. lakers: Agriculture, amenity, and community in predicting opposition to United States wind energy development*, 72 ENERGY RSCH. & SOC. SCI. 9, 12 (2021).

16 *Id*.

17 *See* Theresa M. Groth & Christine A. Vogt, *Rural wind farm development: Social, environmental, and economic features important to local residents*, 63 RENEWABLE ENERGY 1 (Mar. 2014). One study revealed "visual aesthetics play a role in determining the success of a wind development" and that "social beliefs were the strongest predictor of support for wind development." *Id.* at 7.

18 Nicole Buckley Biggs et al., *Landowner decisions regarding utility-scale solar energy on working lands: a qualitative case study in California*, 4 ENV'T RSCH. COMMC'N 1, 6, 9 (2022), available at https://iopscience.iop.org/article/10.1088/2515-7620/ac6fbf/pdf.

19 *Id*.

20 *Id*. at 7.

21 Jessica Wimmer, *Illinois Solar Incentives and Tax Credits*, ARCHITECTURAL DIG. (Feb. 6, 2024), https://www.architecturaldigest.com/reviews/solar/solar-incentives-illinois#:~:text=Yes.%20

potential loss of farmland.[22] In 2023, Illinois ranked 15th nationally for solar energy production.[23] Despite this relatively high national ranking, solar accounted for only 1.71% of the state's electricity.[24] The Solar Energy Industries Association (SEIA) projects solar growth in Illinois over the next five years at more than 1,700%.[25] In anticipation of this growth, opposition to new renewable energy facilities may follow. For example, Oregon has restricted solar development on farmland; solar cannot occupy "more than 12 acres of prime farmland or 20 acres of other farmland unless an exception applies."[26] In Ohio, counties have the authority to designate restricted areas for large-scale renewable energy development.[27]

A key question for renewable energy policy is how to promote renewable energy in a way that simultaneously preserves both agricultural production and community connections to the agricultural landscape. This requires moving beyond a food versus fuel dichotomy and exploring how to generate food and energy while preserving an aesthetically satisfying rural landscape. As described below, agrivoltaics, if positioned within a supportive policy environment, may provide a path forward for Illinois.

II. AGRIVOLTAICS: DUAL-USE SOLAR

Agrivoltaics, also known as dual-use solar, is the combination of solar energy production and agriculture on the same plot of land.[28] Different subsets of agrivoltaics include crop production, animal grazing, and pollinator habitats co-located with solar panels.[29] Before a significant

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Illinois%20gets%20adequate%20sun%20exposure%20for%20most,solar%20costs%20also%20make%20it%20a%20worthwhile%20option.

22 *See generally* Tammie Sloup, *Farmers highlight clean energy project pressures on farmland*, FARMWEEK (Jan. 19, 2024), https://www.farmweeknow.com/policy/national/farmers-highlight-clean-energy-project-pressures-on-farmland/article_5e1204fc-b499-11ee-9a55-33fa0238341c.html.

23 *Illinois Solar*, *supra* note 3.

24 *Id*.

25 *See id*.

26 EISENSON, *supra* note 13, at 161.

27 *Id*. at 149.

28 *Agrivoltaics: Solar and Agriculture Co-Location*, OFF. ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/solar/agrivoltaics-solar-and-agriculture-co-location (last visited Mar. 27, 2024).

29 *Id*. There have also been developments for floatovoltaics, or solar panels on water. Joseph Guzman, *Why put solar panels on the surface of water?*, THE HILL (July 19, 2022), https://thehill.com/changing-america/sustainability/energy/3564585-why-put-solar-panels-on-the-surface-of-water/. Greenhouse production may also be able to utilize solar panels. *See* ERIK DOHLMAN ET AL., ECON. RSCH. SERV., USDA, REP. NO. EIB-264, TRENDS, INSIGHTS, AND FUTURE PROSPECTS FOR PRODUCTION IN CONTROLLED ENVIRONMENT AGRICULTURE AND AGRIVOLTAICS SYSTEMS 23 (2024), available at https://www.ers.usda.gov/webdocs/publications/108221/eib-264.pdf?v=6749.4.

transition to agrivoltaic production will occur—to borrow from the Missouri state slogan—you have to "Show-Me"[30] that it will work.[31]

Initial research has shown positive effects for solar panels and crop production in agrivoltaic systems.[32] For example, one study found that a "dryland agrivoltaic system may be a resilient energy and food system that has reduced vulnerabilities to future climate variability" based on success growing chiltepin peppers, jalapeños, and cherry tomatoes.[33] However, the study placed an emphasis on considering the potential added costs from raised solar panels.[34] Other research projects have focused on different types of fruit and vegetables; root crops and leafy greens have shown promise,[35] while berries[36] and taller crops may not be as efficient.[37] The compatibility

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30 Ben Zimmer, *'Show Me': New Evidence Arises for the Origin of a Slogan About Proof,* THE WALL ST. J. (Sept. 7, 2023, 5:32 PM), https://www.wsj.com/arts-culture/history/show-me-new-evidence-arises-for-the-origin-of-a-slogan-about-proof-d6cd5876 (explaining the origin of the "show me" phrase in Missouri).

31 *Agrivoltaics Map*, OPENEI, https://openei.org/wiki/InSPIRE/Agrivoltaics_Map (last visited Mar. 27, 2024). Different types of agrivoltaics are more popular than others; crop production is one of the least utilized. *Id.*

32 *See generally* Greg A. Barron-Gafford et al., *Agrivoltaics provide mutual benefits across the food-energy-water nexus in drylands*, 2 NATURE SUSTAINABILITY 848 (2019), available at https://doi.org/10.1038/s41893-019-0364-5.

33 *Id*. at 853.

34 *Id*. ("Our results from a dryland system indicate a reduction in daytime temperatures of the solar panels (energy) and microclimate under the panels (food), and a dampening in the diurnal fluctuations of each and day-to-day fluctuations in soil moisture in irrigated agriculture (water)… However, there are probable barriers to wider adoption, which include challenges associated with some forms of mechanized farming and harvest and the additional costs associated with elevating PV arrays to allow for food production in the understorey.").

35 Emiliano Bellini, *Agrivoltaics works better with leafy greens, root crops*, PV MAG. (June 8, 2020), https://www.pv-magazine.com/2020/06/08/agrivoltaics-works-better-with-leafy-greens-root-crops/.

36 Kari Lydersen, *Maine farmer pairs solar panels with wild blueberries. Will the effort bear fruit?*, ME. MONITOR (Sept. 4, 2022), https://themainemonitor.org/maine-farmer-pairs-solar-panels-with-wild-blueberries-will-the-effort-bear-fruit/ ("Blueberry fields and other parcels of rural Maine are being increasingly eyed for housing development, and farmer Paul Sweetland feels the wild blueberry sector is under pressure, especially when market prices drop. But he hopes that a new 'crop' growing in tandem with berries could help boost the local industry and preserve farmland. That would be solar panels that have been installed across 11 acres of the land where Sweetland farms blueberries in Rockport.").

37 Bellini, *supra* note 35 (U.S. scientist Chad Higgins from the Department of Biological and Ecological Engineering at Oregon State University was cited as saying that "[h]e believes that a combination such as strawberries, blueberries, raspberries and lingonberries could also provide for strong power and crop yields. 'But we haven't checked this yet,' Higgins said. 'On the likely not a good idea side are tall crops that may interfere more with the panels like corn or orchard crops.'"). One article explained two types of panel construction for agrivoltaics. Jordan Farrell & Bo Mahr, *Common Ground: Agrivoltaics Provide Mutual Benefits to Developers and Farmers*, HUSCH BLACKWELL (Dec. 20, 2023), https://www.climatesolutionslaw.com/2023/12/common-ground-agrivoltaics-provides-mutual-benefits-for-solar-developers-and-agricultural-production/ ("Elevated panels have been successfully paired with high-value crops, like delicate vegetables and berries, which benefit from the shade and protection provided by the panels. Elevated panels can also be installed over existing cropland. However, elevated configurations come with increased

of crops traditionally grown in the Midwest, such as soybeans and corn, is uncertain,[38] but some studies have started to research this topic.[39] Crop production appears to vary widely depending on location in the U.S., but further research may expand on what crops might successfully grow underneath solar panels.[40]

Solar grazing, the combination of solar energy and animal grazing, along with pollinator-friendly solar, tends to be a more widely used practice.[41] This may be in part due to experience with using livestock as a means of vegetation management, including fire risk reduction[42] and invasive species control.[43] Solar grazing often includes sheep,[44] but studies are looking into the possibility of larger animals.[45] Research has shown that the practice

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installation and maintenance costs, and additional vulnerability to high winds and snow.... Inter-row agrivoltaic configurations, on the other hand, use more traditional panel heights, which are more resilient and can be paired with plants requiring full sun. The spacing between the panels reduces the effect on the surrounding microclimate, benefiting the growing environment and making inter-row agrivoltaics more appealing to farmers. Studies pairing solar panels with typical rotation crops, such as corn and soybeans, are in the early stages, and research is ongoing to determine ideal panel design, crop pairings, and spacing.").

38 *See* DOHLMAN ET AL., *supra* note 29 (According to the USDA, "[t]o date, AV systems with commodity crop (e.g., wheat, corn, soybeans) production have been infeasible, although research is ongoing.").

39 Steve Martin, *Purdue agrivoltaic farming structures and software harvest solar power at lower cost and with minimal impact on crop yield*, PURDUE (May 24, 2023), https://www.purdue.edu/newsroom/releases/2023/Q2/purdue-agrivoltaic-farming-structures-and-software-harvest-solar-power-at-lower-cost-and-with-minimal-impact-on-crop-yield.html.

40 Mark Uchanski et al., *Characterization of Agrivoltaic Crop Environment Conditions Using Opaque and Thin-Film Semi-Transparent Modules*, 16 ENERGIES 1, 9 (2023), available at https://www.mdpi.com/1996-1073/16/7/3012 ("Semi-transparent PV panels offer a solution that caters to specific agricultural applications depending on the crop type and climate.").

41 Farrell & Mahr, *supra* note 37 (describing pollinator-friendly solar as a "system [that] is both simple and flexible: it often only involves the developer installing solar arrays and seeding pollinator-friendly plants around and/or beneath the panels. While the plants may take several seasons to become established, their presence will ultimately benefit the surrounding agriculture, which depends on pollinators for crop yield. As a secondary benefit, these plants keep the solar panels cooler, increasing performance and longevity while reducing mowing and maintenance cost for developers."); Katie Siegner et al., *Maximizing Land Use Benefits from Utility-Scale Solar*, CBEY (Nov. 4, 2021), https://cbey.yale.edu/research/maximizing-land-use-benefits-from-utility-scale-solar ("Pollinator-friendly solar also results in more groundwater recharge and a greater reduction in soil erosion than either conventional solar or farming — two additional ecosystem benefits. Lastly, pollinator-friendly solar contributes another sizable social benefit in the form of increased crop yields when projects are sited near pollinator-dependent farmland.").

42 Charles A. Taylor, Jr., *Targeted Grazing to Manage Fire Risk, in* TARGETED GRAZING HANDBOOK 108 (2006), available at https://bof.fire.ca.gov/media/8861/2-d-i-targeted-grazing-handbook_chpt12.pdf.

43 Garin Groff, *Grazing Arizona: Goats vs. Mesa weeds*, E. VALLEY TRIB. (Dec. 12, 2017), https://www.eastvalleytribune.com/local/mesa/grazing-arizona-goats-vs-mesa-weeds-round-2/article_fb00dcf0-2354-11e0-b3e1-001cc4c03286.htm.

44 *What is solar grazing?*, AM. SOLAR GRAZING ASS'N, https://solargrazing.org/what-is-solar-grazing/ (last visited May 23, 2024).

45 Bradley J. Heins et al., *Agrivoltaics to shade cows in a pasture-based dairy system,* 2635 AIP CONF. PROC. 060001-1, 060001-5 (2022), https://pubs.aip.org/aip/acp/article/2635/1/060001/2830634/

of grazing sheep underneath solar panels can increase animal welfare and land productivity.[46] However, effective management of pasture mixes in agrivoltaic operations is essential to achieve the best results.[47] Solar grazing also has the ability to provide additional income to sheep farmers; one study found net grazing incomes at $262 (directly contracted) per acre and $244 (subcontracted) per acre in the Eastern U.S.[48]

Agrivoltaics have been met with mixed reviews from various stakeholders.[49] For solar developers, agrivoltaics adds complexity to system design and community communication.[50] On the other hand, agrivoltaics may facilitate the development process.[51] One study found that individuals view agrivoltaics more positively than conventional solar, with 81.8% of the survey respondents indicating "they would be *more likely* to support a solar project in their community that combines both energy and food

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Agrivoltaics-to-shade-cows-in-a-pasture-based?searchresult=1 ("Based on the results of this study, cows may have sacrificed grazing time to stand in the protection of the shade. Our study indicates that agrivoltaics may provide an acceptable method of heat abatement to pastured dairy cows, as well as generating electrical energy for farmers, thus reducing the carbon footprint of the dairy operation.").

46 *See* Alyssa Andrew et al., *Herbage Yield, Lamb Growth and Foraging Behavior in Agrivoltaic Production System*, 5 FRONTIERS SUSTAINABLE FOOD SYS. 1, 10 (2021), available at https://www.frontiersin.org/articles/10.3389/fsufs.2021.659175/full ("In addition to the increased land productivity and improved animal welfare, the results from [the] study support the benefits of agrivoltaics as a sustainable agricultural system. Overall, lower pasture yields under in fully shaded areas under the solar panels were the main cause of inferior pasture production in agrivoltaic sites in the current study. When designing pasture mixtures for agrivoltaic systems, a selection of pasture species that are not only tolerant to shade but also persistent under heavy traffic should be considered."); *see also* Matthew A. Sturchio et al., *Agrivoltaic arrays can maintain semi-arid grassland productivity and extend the seasonality of forage quality*, 356 APPLIED ENERGY 122418 (2023), available at https://www.sciencedirect.com/science/article/abs/pii/S0306261923017828.

47 *See id*.

48 NIKOLA KOCHENDOERFER ET AL., DAVID R. ATKINSON CTR. SUSTAINABLE FUTURE, THE AGRICULTURAL, ECONOMIC AND ENVIRONMENTAL POTENTIAL OF CO-LOCATING UTILITY SCALE SOLAR WITH GRAZING SHEEP 4, available at https://solargrazing.org/wp-content/uploads/2021/02/Atkinson-Center-Full-Report.pdf.

49 Gabriele Torma & Jessica Aschemann-Witzel, *Social acceptance of dual land use approaches: Stakeholders' perceptions of the drivers and barriers confronting agrivoltaics diffusion,* 97 J. RURAL STUD. 610, 621 (2023) (analyzing the differences between how different stakeholders value different aspects of agrivoltaics).

50 Alexis S. Pascaris et al., *Integrating solar energy with agriculture: Industry perspectives on the market, community, and socio-political dimensions of agrivoltaics*, 75 ENERGY & SOC. SCI. 1, 7 (2021). "Solar industry professionals in this study view agrivoltaic projects as complex and requiring extra effort to actualize, including added layers of intricacy in system design and increased coordination with stakeholders…. Some participants expressed doubts that investors would finance an agrivoltaic project because dual use has the potential to compound risks and uncertainties." *Id.* "Relative to conventional solar development, study participants explained how agrivoltaics have the potential to deliver multiple technical, environmental, and social benefits, which is attracting buy-in from early innovators.... Early adopters explained their logic behind trade-off analysis, highlighting that soft benefits in the short-term are considered just as long-term hard costs are." *Id*. at 5.

51 *Id*. ("Agrivoltaics, however, was regarded as a development strategy that could inspire greater community acceptance of a project" for some solar developers.").

production."[52] It remains unclear what the value of agrivoltaic development is to general electricity consumers.[53] Another article revealed that people viewed agrivoltaics as highly expensive, a practice that will promote unsustainable farming practices, and a practice that may increase land use conflict between crop and energy production.[54] In the same survey, some participants saw agrivoltaics as an "emergency exit for farmers not to lose agricultural land for total crop production" and placed importance on effective regulations.[55] As solar development continues to expand onto existing farmland, it will be important to understand the community outlook on agrivoltaics and implications for local land use siting.

For farmers, solar development can be a potentially environmentally friendly alternative compared to other land conversion options.[56] Some have argued for the use of land-specific conservation agriculture management practices for dual-use solar practices to further strengthen agrivoltaics' sustainability as a system.[57] Aside from sustainability concerns, farm and rural values can affect solar siting more broadly as "farming [can be seen] as an identity rather than an occupation alone."[58] One study found "that agricultural and pollinator interviewees typically did not understand energy systems, and energy sector interviewees did not understand agricultural systems," showing a disconnect between two major stakeholders in agrivoltaics.[59] As it will be important to understand community response to agrivoltaic projects, it will be equally important to meet the needs of farmers and solar developers and to have communication between them.

The coexistence of solar energy production and agriculture complicates an already difficult solar development process.[60] Solar development rules, such as zoning and setback requirements, must be integrated with traditional

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52 *Id*. at 6.

53 DOHLMAN ET AL., *supra* note 38, at 23 ("Although consumers have been willing to pay a premium for electricity from renewable energy (including solar), it is not well-established if consumers will pay a premium for solar-generated electricity because the electricity was generated at an AV site.").

54 Torma & Aschemann-Witzel, *supra* note 50, at 615-17.

55 *Id*. at 616-17.

56 ANUJ KRISHNAMURTHY & OSCAR SERPELL, KLEINMAN CTR. ENERGY POL'Y, HARVESTING THE SUN: ON-FARM OPPORTUNITIES AND CHALLENGES FOR SOLAR DEVELOPMENT 3 (2021), available at https://kleinmanenergy.upenn.edu/research/publications/harvesting-the-sun-on-farm-opportunities-and-challenges-for-solar-development/ ("[S]olar panels produce no additional toxic waste, and aside from soil disturbance during installation or removal, they have little long-term impact on the productivity of the land on which they are sited…. Onfarm solar (or agrivoltaics) can offer farmers and rural landowners a smaller environmental footprint and fewer economic risks than oil and gas development.").

57 Alson Time et al., *Conservation agrivoltaics for sustainable food-energy production,* 6 PLANTS, PEOPLE, PLANET, 558, 559-65 (2024).

58 Sharlissa Moore et al., *Can we have clean energy and grow our crops too? Solar siting on agricultural land in the United States*, 91 ENERGY RSCH. & SOC. SCI. 1, 4 (2022).

59 *Id*. at 10.

60 Max Trommsdorff, *Agrivoltaics: Where are we heading?,* PV MAG. (Mar. 9, 2021), https://www.pv-magazine.com/magazine-archive/agrivoltaics-where-are-we-heading/.

farm regulatory structures and production risks. Despite these challenges, agrivoltaics has shown promise both domestically and internationally.[61] One study estimated that the global energy demand "could be offset by solar production if <1% of agricultural land at the median power potential of 28 W/m^2 were suitable candidates for agrivoltaic systems and converted to dual use."[62] Meeting energy production potential, however, is dependent upon a policy environment that could either promote or hinder further development.[63] The following section describes the national policy landscape, reviews initiatives in states with active agrivoltaic facilities, and closes with an analysis of Illinois initiatives.

III. THE POLICY LANDSCAPE FOR AGRIVOLTAICS

A. National Perspectives

Agrivoltaics receives federal support through funding for the research and development of dual-use projects.[64] The U.S. Department of Energy (DOE) has funded agrivoltaics research since 2015.[65] The DOE's Solar Energy Technologies Office (SETO) administers the Foundational Agrivoltaic Research for Megawatt Scale (FARMS) program[66] and maintains a cooperative agreement with the National Center for Appropriate Technology to connect stakeholders and "enhance[e] the long-term performance" of agrivoltaics.[67] The DOE also funds the Innovative Solar Practices Integrated with Rural Economies and Ecosystems (InSPIRE)

61 *Id*.

62 Elnaz H. Adeh et al., *Solar PV Power Potential is Greatest Over Croplands*, 9 SCI. REPS. 1, 4 (2019).

63 *See generally* Alison F. Takemura, *Agrivoltaics finds new fans in US Senate*, CANARY MEDIA (June 20, 2023), https://www.canarymedia.com/articles/solar/agrivoltaics-finds-new-fans-in-us-senate (explaining how a passage of just one act can vastly increase developments in the agrivoltaics industry).

64 DOHLMAN ET AL., *supra* note 38, at 18.

65 *Id*. ("DOE-SETO has been funding research on agrivoltaics since 2015, and funding has expanded significantly since then. In fiscal year 2020, DOE-SETO provided $130 million in funding for solar projects, and $7 million of that funded four AV projects (Davis & Macknick, 2022; DOE-SETO, 2020).").

66 *Foundational Agrivoltaics Research for Megawatt Scale (FARMS) Funding Program*, OFF. ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/solar/foundational-agrivoltaic-research-megawatt-scale-farms-funding-program (last visited Mar. 27, 2024).

67 *About*, AGRISOLAR CLEARINGHOUSE, https://www.agrisolarclearinghouse.org/about/ (last visited Mar. 27, 2024); *see also* Alexis S. Pascaris et al., *From niche-innovation to mainstream markets: Drivers and challenges of industry adoption of agrivoltaics in the U.S.*, 181 ENERGY POL'Y 1, 9 (2023) ("Appropriations for the maintenance of the AgriSolar Clearinghouse (NCAT, 2023), a critical hub that facilitates circulation and aggregation of agrivoltaic knowledge, could also be regarded as key to enhancing the long-term performance of the technology.").

project,[68] which administers the Agriculture and Solar Together: Research Opportunities (ASTRO) Seed Grants for small funding opportunities for further agrivoltaics research.[69]

The U.S. Department of Agriculture (USDA) has also funded various agrivoltaics-focused projects.[70] The USDA's National Institute of Food and Agriculture (NIFA) Sustainable Agriculture Systems program awarded funding support to the Sustainability Co-locating Agricultural and Photovoltaic Electricity System (SCAPES) project,[71] and the USDA's Climate-Smart Commodities Project has provided support for other research activities.[72] NIFA has also sponsored agrivoltaic projects through its small business grant program.[73] Other potential agrivoltaic funding sources include the Business Energy Investment Tax Credit (ITC) through the Internal Revenue Service (IRS) and the USDA's Rural Energy for America Program (REAP).[74] Other federal government policies or funding opportunities may be synergistic with agrivoltaics, especially in the context of agricultural and solar energy, but they lack explicit programmatic connections.[75]

From a legislative perspective, a few Congressional proposals have signaled initial interest in the agrivoltaics field.[76] Proposed bipartisan bills such as the Agrivoltaics Research and Demonstration Act of 2023[77] and the

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68 *Innovative Solar Practices Integrated with Rural Economies and Ecosystems*, OPENEI, https://openei.org/wiki/InSPIRE (last visited Mar. 27, 2024).

69 *Agriculture and Solar Together: Research Opportunities*, OPENEI, https://openei.org/wiki/InSPIRE/ASTRO (last visited Mar. 27, 2024).

70 DOHLMAN ET AL., *supra* note 38, at 23 ("Understanding the potential benefits of agrivoltaics for generating renewable electricity and addressing climate change is a USDA research priority.").

71 Paul Hollis, *"Agrivoltaic" research combines solar energy, food production*, AUBURN AGRIC. (Oct. 6, 2021), https://agriculture.auburn.edu/feature/agrivoltaic-research-combines-solar-energy-food-production/.

72 DOHLMAN ET AL., *supra* note 38, at 23.

73 *See* NIFA, *Integrating Agrivoltaics: Studying the Synergistic Relationship Between Transparent Solar Panels and Horticulture,* USDA, https://portal.nifa.usda.gov/web/crisprojectpages/1019484-integrating-agrivoltaics-studying-the-synergistic-relationship-between-transparent-solar-panels-and-horticulture.html (last visited May 24, 2024).

74 Alexis S. Pascaris, *Examining existing policy to inform a comprehensive legal framework for agrivoltaics in the U.S.*, 159 ENERGY POL'Y 1, 4 (2021).

75 *Id*. at 1.

76 *See generally* Press Release, U.S. Senators Martin Heinrich & Mike Braun, Heinrich, Bruan Introduce Bipartisan Bill to Support Agrivoltacis Research and Demonstration (May 31, 2023), available at https://www.heinrich.senate.gov/newsroom/press-releases/heinrich-braun-introduce-bipartisan-bill-to-support-agrivoltaics-research-and-demonstration (showing the low amount of proposed bills introduced to Congress); *see generally* Press Release, U.S. Senators Tammy Baldwin & Chuck Grassley, Baldwin, Grassley Introduce Bill to Protect and Invest in Farmland Used for Renewable Energy Developments (Sept. 25, 2023), available at https://www.baldwin.senate.gov/news/press-releases/baldwin-grassley-introduce-bill-to-protect-and-invest-in-farmland-used-for-renewable-energy-developments (showing the low amount of proposed bills introduced to Congress).

77 *See* Press Release, U.S. Senators Heinrich & Braun, *supra* note 76.

Protecting Future Farmland Act[78] have called for a clear regulatory definition of agrivoltaics and directed the USDA to expand research projects. The Protecting Future Farmland Act, proposed in September of 2023, called for prioritizing funding through REAP for projects that have conservation and vegetation management plans, including those with agrivoltaic installations.[79] As federal interest in agrivoltaics evolves, its intersection with state and local government initiatives, both in support and opposition to solar development, warrants close attention.[80]

B. State Agrivoltaic Policy Initiatives

At the state level, a mix of incentives to meet renewable energy mandates and policy initiatives to solve land-use conflicts present a more complex regulatory environment for agrivoltaics, as distinguished from traditional single-purpose solar installations.[81] A general lack of agrivoltaic-specific policy recommendations or requirements likely can be attributed to the novelty and economic uncertainty of the practice.[82] However, as described below, a few states have developed regulatory programs that expressly define agrivoltaics or, in some cases, even incentivize development to advance the state's renewable energy or conservation goals.[83] For example, some states have enacted policies that allow the land underneath solar panels to retain classification as agricultural land for property taxes.[84] Other states

78 *See* Press Release, U.S. Senators Baldwin & Grassley, *supra* note 76.

79 Protecting Future Farmland Act of 2023, S. 2931, 118th Cong. § 3 (2023).

80 *See* Takemura, supra note 63 (noting how interest in agrivoltaics has, according to the energy program director of the National Center for Appropriate Technology, been "greatly expanding").

81 *See, e.g.*, Jessica Guarino & Tyler Swanson, *The Illinois Agrivoltaics Regulatory and Policy Guide Analyzes State and Local Laws*, AGRISOLAR CLEARINGHOUSE (Feb. 1, 2023), https://www.agrisolarclearinghouse.org/the-illinois-agrivoltaics-regulatory-and-policy-guide-analyzes-state-and-local-laws/ ("[W]hile the excitement around agrivoltaics in all its forms blazes a new trail for what solar energy land use can look like, eager landowners and developers face a daunting challenge: state laws and local zoning ordinances that have not considered the possibility that agricultural and solar energy production could feasibly be located on the same tract of land.").

82 *See* Sarah Brunswick & Danika Marzillier, *The New Solar Farms: Growing a Fertile Policy Environment for Agrivoltaics*, 24 MINN. J.L. SCI. & TECH. 123, 152 (2023) ("[I]nformation gaps, externality problems, and localized resistance in many rural communities plague the nation's fledgling agrivoltaics industry.").

83 DOHLMAN ET AL., *supra* note 29, at 23 ("AV sites are commonly incentivized by State and local programs because of the sites' potential to provide local agri-environmental benefits and mitigate concerns regarding land use competition.").

84 *See* HEIDI KOLBECK-URLACHER, CTR. RURAL AFFS., POLICY APPROACHES FOR DUAL-USE AND AGRISOLAR PRACTICES 7–8 (2023), available at https://www.agrisolarclearinghouse.org/wp-content/uploads/2023/04/AgriSolar_Dual-use-solar_041123v2.pdf ("Rhode Island has amended its Farm, Forest, and Open Space Land law to exempt landowners from a land-use change tax if they are integrating a dual-use renewable energy generation system, which is defined as a wind or solar system that allows agricultural practices to continue around it under normal practices.").

have taken a soft law approach by developing factsheets or supporting university extension programs.[85]

In the agrivoltaics industry, the Solar Massachusetts Renewable Target (SMART)[86] program, accompanied by the Agricultural Solar Tariff Generation Unit (ASTGU), is often recognized as a model program.[87] An ASTGU is a "Solar Tariff Generation Unit located on Land in Agricultural Use or Important Agricultural Farmland that allows the continued use of the land for agriculture."[88] Program provisions require minimal soil impact, addressing water conservation and quality concerns, and maintaining a vegetative cover.[89] In addition, solar panels comprising an ASTGU may not "interfere with the continued use of the land beneath the canopy for agricultural purposes" to optimize the balance between agricultural and energy production.[90] Annual reporting is required to demonstrate that the site "continues to engage in commercial agricultural[sic] to retain and use the land primarily and directly for agricultural purposes pursuant to M.G.L. c. 61A §§1 and 2."[91] There is a waiver available to explain decreased agricultural yield due to unforeseen circumstances,[92] but consequences may remain unclear if the waiver is not accepted.[93] Reporting may be an

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85 *See, e.g.*, Conn. Dep't Energy & Env't Prot., *STEPS is Sustainable, Transparent and Efficient Practices for Solar Development*, CT.GOV (Aug. 2023), https://portal.ct.gov/DEEP/Planning/Steps-for-Solar-Development (indicating that Connecticut's Department of Energy & Environmental Protection drafted guidance for siting solar on agricultural land, suggesting agrivoltaic development); *see also* CONN. DEP'T ENERGY & ENV'T PROT. & CONN. DEP'T AGRIC., DRAFT GUIDANCE FOR SITING SOLAR ON AGRICULTURAL LAND 2 (2023), available at https://portal.ct.gov/-/media/DEEP/Permits_and_Licenses/Client-Concierge/DRAFT-Guidance-for-Siting-Solar-on-Agricultural-Land.pdf (recommending "dual use systems that maximize crop production and minimize changes to existing vegetation management, while also incorporating solar energy production"). Furthermore, New York has just passed a bill establishing agrivoltaics research and development in Cornell University's College of Agricultural and Life Sciences. *See* S. 7081, 2023 Leg., Reg. Sess. (N.Y. 2023).

86 225 MASS. CODE REGS. § 20.00 (2024).

87 *See* Jessica Guarino & Tyler Swanson, *Emerging Agrivoltaic Regulatory Systems: A Review of Solar Grazing*, 12 CHI. KENT J. ENV'T ENERGY L. 1, 23 (2022) (noting that the Massachusetts Solar Renewable Target (SMART) Program is the most prominent policy that actively promotes dual land use).

88 225 MASS. CODE REGS. § 20.02 (2024).

89 *See id*. at § 20.05(5)(e) (providing several performance standards).

90 *Id*. at § 20.06(1)(d).

91 MASS. DEP'T ENERGY RES. & DEP'T AGRIC. RES., GUIDELINE REGARDING THE DEFINITION OF AGRICULTURAL SOLAR TARIFF GENERATION UNITS 6 (2022), available at https://www.mass.gov/doc/guideline-regarding-the-definition-of-agricultural-solar-tariff-generation/download.

92 *See id*. at 6-7 ("Due to unforeseen circumstances, such as but not limited to weather events, pests, or change in crops, the projected agricultural yield for any given year may be lower than stated in the agricultural plan or previous year's annual report. In these instances, an applicant can request a waiver to the Department for the decreased yields. The applicant must demonstrate to the satisfaction of the Department, and in consultation with MDAR, that a waiver is warranted for good cause.").

93 *See* Jonathan Klavens et al., *Solar Project Development: the Special Case of Agrivoltaic Projects*, BOS. BAR ASS'N (Nov. 18, 2020), https://bostonbar.org/journal/solar-project-development-the-

opportunity for furthering technological advances and economic knowledge to inform future agrivoltaic projects,[94] but importance should be placed on incentivizing the practice.[95] As an incentive, an ASTGU will receive a compensation rate Adder Value of $0.06 ($/kWh) in addition to the Generation Unit Capacity Base Compensation Rate Factor.[96] Although the regulatory complexity and mandatory design elements of an ASTGU may hinder a developer's energy production goals and impose unnecessary requirements for certain agricultural practices,[97] many have praised the program as a strong first step for incentivizing agrivoltaic development.[98]

New Jersey has proposed a Dual-Use Solar Energy Pilot Program informed by research through pilot projects over the next few years involving farms with previous agricultural or horticultural use across diverse land types and crop production.[99] Proposed requirements stipulate that "land below and

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special-case-of-agrivoltaic-projects/ ("While it is important to ensure that there are not significant detrimental effects on agriculture from an ASTGU, there could be many appropriate reasons for reduced productivity, such as a drought year or appropriate crop rotation. The approval process thus far has raised questions about the appropriate baseline for measuring impacts, determining which impacts to attribute to the solar facility or to other causes, what type or magnitude of impact would result in disqualification of an ASTGU or removal of its adder.").

94 *Cf.* Brunswick & Marzillier, *supra* note 83, at 154 ("Farmers' limited knowledge about agrivoltaics and their practical and economic benefits further constrains agrivoltaics growth."). This type of knowledge will be important as "[f]arm operators and rural communities need to be empowered with the information to make financially and environmentally sound decisions regarding on-farm energy development." Anuj Krishnamurthy & Oscar Serpell, *Harvesting the Sun: On-Farm Opportunities and Challenges for Solar Development*, KLEINMAN CTR. ENERGY POL'Y (July 12, 2021), https://kleinmanenergy.upenn.edu/research/publications/harvesting-the-sun-on-farm-opportunities-and-challenges-for-solar-development/. Accordingly, "[o]ne of the central goals of policymakers interested in facilitating on-farm solar development should be to help clarify the full financial picture of a proposed project." *Id.*

95 *See, e.g.*, Brunswick & Marzillier, *supra* note 82, at 173 ("[S]tates should ensure that their tax code does not impose burdens that disincentivize agrivoltaics development.").

96 *See* 225 MASS. CODE REGS. § 20.07(4)(a), (f) (2024). The adder value "increase the per-kWh incentive amount" for developing different types of solar projects. Siena Hacker, *Massachusetts SMART Solar Program: 2024 Overview*, SOLAR.COM (Dec. 29, 2023), https://www.solar.com/learn/massachusetts-smart-solar-program-complete-overview/.

97 *See* Pascaris, *supra* note 74, at 5 ("Despite the ASTGU's intention to stimulate agrivoltaic development, the program itself is marked by system design requirements and regulatory hurdles that may discourage interested parties."); *see also* Jonathan Klavens et al., *supra* note 93 ("There may well be many more types of symbiotic solar and agricultural uses that do not fit within the current requirements for ASTGUs. For example, mushroom cultivation, beekeeping and animal husbandry are all farming activities that might benefit from shade reduction greater than 50%. The state's Department of Energy Resources ("DOER") has a process for seeking waivers for unique and worthwhile alternatives but obtaining an exception is not easy, quick or predictable."); KOLBECK-URLACHER, *supra* note 84, at 12 ("Siting regulations should be carefully crafted to ensure they don't restrict dual-use. For example, setting restrictions on panel height or developing overly prescriptive vegetation management requirements can limit dual-use opportunities.").

98 *See* Brunswick & Marzillier, *supra* note 82, at 151; *see also* Pascaris, *supra* note 74, at 5.

99 *See* N.J. BD. OF PUB. UTILS., NOTICE, IN THE MATTER OF THE DUAL-USE SOLAR ENERGY PILOT PROGRAM 5 (2023), available at https://www.nj.gov/bpu/library/Dual%20Use%20Solar%20Energy%20Pilot%20Straw%20Proposal.pdf.

adjacent to the solar panels in dual-use projects is to remain in continued, simultaneous, and active agricultural or horticultural use."[100] A 10-megawatt capacity limit would be established for each project, and development on prime agricultural soil and coastal or freshwater wetlands would be barred with few exceptions.[101] Regulators have acknowledged a need for flexibility in the agrivoltaic design processes, along with an emphasis on agricultural quality monitoring, decommissioning, environmental justice,[102] and water management, with the goal of minimizing impacts on farmland.[103]

The New Jersey proposal further recommends that agricultural land used for agrivoltaic development maintains eligibility for property tax assessment as farmland.[104] From a land use perspective, approved dual-use solar energy projects would be considered a permitted use within every municipality,[105] and local governments would not be required to update ordinances or issue variances.[106] Furthermore, agrivoltaic sites would be eligible for Right to Farm Act protection.[107]

New Jersey's Dual-Use Solar Energy Pilot Program holds promise for informing a more permanent dual-use incentive program.[108] With minimal solar panel construction requirements and a flexible adder, the program may alleviate concerns with Massachusetts' SMART program, such as overly restrictive design requirements.[109] The flexible adder may also allow for various projects, whereas a standard rate adder for every agrivoltaic design may not cover the costs of new research developments.[110] In addition, the pilot program's permitted use designation of agrivoltaics for all municipalities may alleviate regulatory barriers that otherwise complicate development projects, such as specialized zoning rules and property tax considerations.[111] On the other hand, stripping local authorities of power to

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100 *Id*.

101 *Id*. at 6-7 (citing N.J. STAT. § 48:3-87.13(b)(1), (5) (2023)).

102 *See id*. at 5 ("E.O. 23" all agencies, departments, boards, etc. encompassing the Executive Branch of the State Government in New Jersey have been required to consider environmental justice in the implementation of their mandatory and regulatory responsibilities."); *see also* Exec. Order No. 23 (Apr. 20, 2018), 50 N.J. Reg. 1241(b) (May 21, 2018).

103 *See* N.J. BD. PUB. UTILS., *supra* note 99, at 21.

104 *See id*. at 15 ("Staff recommends mandating as a minimum requirement that the farm parcel maintain its eligibility for state farmland assessment taxation after construction of the solar facility.").

105 *Id*. at 12 (citing N.J. STAT. § 48:3-87.13(f) (2021)).

106 *Id*. at 26.

107 *Id*. at 41.

108 *Id*. at 10.

109 Brunswick & Marzillier, *supra* note 82, at 149.

110 *Id*. at 150 ("Moreover, SMART's incentives may not sufficiently offset the financial cost of agrivoltaics or adequately reward farmers for the positive social benefits of these projects.").

111 *Id*. at 172 ("To avoid unintended property tax impacts in the context of agrivoltaics, states could develop an agrivoltaics-specific tax policy that resolves the conflicts between agricultural and solar interests. Because of the value that agrivoltaic infrastructure brings to a property, states should incorporate an agrivoltaic-specific provision that addresses valuation of agrivoltaic-developed

regulate project design and placement may implicate justice considerations, especially in small communities.[112] Tailoring the role of local government oversight, as with many land use rules, will likely require multiple iterations as this technology matures and diffuses.[113]

Maine presents a third case study from the Northeastern U.S. in agrivoltaic policy development.[114] The Governor's Energy Office and the Maine Department of Agriculture, Conservation, and Forestry established an Agricultural Solar Stakeholder Group tasked to develop policy recommendations for protecting farmland from solar energy development.[115] The group recommended creating a dual-use pilot program and specifically noted the importance of considering current use taxation.[116]

Two states, Colorado and Maryland, have implemented tax provisions to promote agrivoltaic development.[117] Agrivoltaic projects in Colorado that follow certain design specifications are exempt from personal property taxes.[118] The state also allocated $500,000 to study agrivoltaics' ability to mitigate agricultural production impacts from climate change, lessen energy costs, increase economic resilience, minimize environmental impacts of solar, and compare project costs with traditional solar development.[119] Maryland amended its Community Solar Energy Generating Systems Program and accompanying property tax rules to include agrivoltaic development.[120]

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land."); *see also* M. Taylor et al., *Justice-driven agrivoltaics: Facilitating agrivoltaics embedded in energy justice*, 188 RENEWABLE & SUSTAINABLE ENERGY REV. 1, 5 (2023) ("Specifically, the Clean Energy Act provides clarity that an agrivoltaics project is treated as an agricultural use and therefore the land remains as agricultural land for property tax purposes. The Clean Energy Act provides the additional impetus for a new commission to identify obstacles to agrivoltaics projects and formulate strategies to address these challenges in Massachusetts.").

112 Pascaris, *supra* note 74, at 6; *see also* Taylor et al., *supra* note 111, at 6-7 ("Like other large-scale renewable energy projects, agrivoltaics design must incorporate community interests to achieve procedural justice…. Recognition justice also aligns with policy measures to empower farmers to actively participate in agrivoltaics projects enhancing incentivization functions.").

113 *See* Pascaris, *supra* note 74, at 1.

114 *Agricultural Solar Stakeholder Group*, ME. GOVERNOR'S ENERGY OFF., https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/agricultural-solar-stakeholder-group (last visited May 24, 2024).

115 *Id*.

116 *Id*.

117 COLO. REV. STAT. § 39-3-122 (2023); Community Solar Energy Generating Systems Program and Property Taxes, H.B. 908, 2023 Leg., Reg. Sess. (Md. 2023).

118 *See* COLO. REV. STAT. § 39-3-122 (2023).

119 *Id*.

120 Community Solar Energy Generating Systems Program and Property Taxes, H.B. 908, 2023 Leg., Reg. Sess. (Md. 2023).

C. Policy Observations and Critiques

In 2023, the American Farmland Trust (AFT) recommended that state support for agrivoltaic installations be farm-centered.[121] Moreover, states should specifically define the terms of an agrivoltaic installation, provide for periodic location checks to ensure converted land remains agricultural, impose financial penalties for non-compliance, and implement plans to report agrivoltaics data to promote collaboration.[122] As a relatively new technology, agrivoltaic systems take a variety of shapes, sizes, and productive output—both in terms of solar energy and agricultural production.[123] A harmonized definition may facilitate diffusion by reducing cross-jurisdictional barriers and calibrating community and stakeholder expectations.[124] A one-size-fits-all approach, however, may not be an optimal path given the infancy of the industry and ongoing research efforts designed to maximize dual-use productivity.[125] Nonetheless, some common principles should be incorporated into state-level definitions. Designating a minimum percentage of land in active agricultural production per solar installation site could be a first step. That percentage would need to vary based on agronomic factors such as weather, soil quality, stocking densities (if grazing), and perhaps prior agricultural use.[126] However, to qualify as agrivoltaic, there should be some significant level of dual-use.[127] Currently, New Jersey's straw proposal for the Dual-Use Solar Energy Pilot Program seeks input regarding a definition of land "actively devoted to agricultural and horticultural use."[128] Similar concerns have been raised in Maine regarding the need for the Department of Agriculture, Conservation, and Forestry to develop a definition of "dual-use agricultural and solar production."[129]

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121 Samantha Levy, *American Farmland Trust Releases Smart Solar Recommendations to Help Policymakers Advance Solar and Strengthen Farm Viability*, AM. FARMLAND TR. (Dec. 13, 2023), https://farmland.org/aft-releases-smart-solar-recommendations-to-help-policymakers-advance-solar-and-strengthen-farm-viability/; AM. FARMLAND TR., RECOMMENDATIONS FOR STATE AND LOCAL GOVERNMENTS TO ADVANCE SMART SOLAR POLICY (2023), available at https://farmland.org/wp-content/uploads/2023/12/AFT-Recommendations_for_State_and_Local_Governments_to_Advance_Smart_Solar_Policy.pdf.

122 *Id*.

123 *Agrivoltaics: Solar and Agriculture Co-Location, supra* note 28.

124 M. Taylor et al., *supra* note 28, at 4 ("Without a harmonized definition for agrivoltaics systems, there is a real possibility of ad hoc policy and legal approaches creating barriers to industry entry across various jurisdictions and planning controls.").

125 *Id*. at 4-5.

126 *Id*. at 9.

127 Brunswick & Marzillier, *supra* note 82, at 144.

128 N.J. BD. PUB. UTIL., *supra* note 100, at 8.

129 *Solar Energy Development and High-Value Agricultural Land: Request for Stakeholder Input*, ME. DEP'T AGRIC, CONSERVATION & FORESTRY (Oct. 6, 2023), https://www.maine.gov/dacf/about/news/news.shtml?id=11972311 (Maine has granted the Department permitting authority for some solar energy projects, which has led to calls for a qualifying definition.).

Potential zoning and property tax issues could be resolved by defining agrivoltaics.[130] For example, various current use programs may tax agricultural or forest land at less than its market value to disincentivize land conversion for other uses.[131] Regulatory silence with respect to how agrivoltaic development may alter zoning or tax classifications could result in converted agrivoltaic land falling out of compliance and facing potential tax penalties.[132] The North Carolina Department of Revenue Present-Use Valuation Program Guide provides an instructive example of the potential complexity.[133] The Department noted, "there are situations where grazing sheep mesh well with solar array systems which are sufficiently elevated to permit the sheep to graze more or less freely beneath the panels and framework."[134] In those situations, "the affected acreage could be considered as being in production" and quality for preferential property tax treatment because the entirety of the land is capable of being grazed.[135] Importantly, agrivoltaic installations should be considered on a case-by-case basis.[136]

Although lacking certainty unless a pre-determination could be made early in the project development stage, a case-by-case basis for determining exemptions to property taxes and zoning restrictions may be an attractive option for states seeking to promote agrivoltaics as a renewable energy source and prevent further conversion of productive farmland to other uses.[137] Taxation rates for farmland are usually far better for developers than for commercial or industrial zones.[138] For example, Massachusetts recently updated its law to ensure land used for agrivoltaics would remain taxed as agricultural land, an important step in clearing legal confusion that otherwise

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130 Brunswick & Marzillier, *supra* note 82 at 165.

131 *Understanding Current Use Taxation Policies*, FARM & ENERGY INITIATIVE, https://farmandenergyinitiative.org/projects/farmland-solar-policy/policy-design-toolkit/current-use-taxation/ (last visited Apr. 4, 2024) ("Current Use Taxation policies are state beneficial taxation programs in which agricultural land is assessed and taxed at its agricultural value, rather than market value, so long as the land continues to be used or available for agricultural purposes…. They create an incentive for private landowners to keep their land undeveloped by providing some relief from market pressure to convert agricultural, open space, and forest land to economically "best uses" through development.").

132 *See* Klavens et al., *supra* note 93.

133 N.C. DEP'T REV., PRESENT-USE VALUATION PROGRAM GUIDE 51 (2023), available at https://www.ncdor.gov/present-use-value-program-guide.

134 *Id*.

135 *Id*.

136 *Id*.

137 Michael Nuckols, *Considerations when Leasing Agricultural Lands to Solar Developers,* CORNELL DEP'T AGRIC. & LIFE SCI. (Apr. 6, 2020), https://smallfarms.cornell.edu/2020/04/considerations-when-leasing-agricultural-lands-to-solar-developers/.

138 *Id*.; *Understanding Current Use Taxation Policies*, *supra* note 131 ("State programs vary on the activities permitted on enrolled land. When a landowner commences a land use not permitted by the state's current use program, this may constitute 'land use conversion,' disqualifying the land from beneficial taxation…. If land enrolled in a current use program no longer meets the criteria for beneficial taxation, the landowner is likely to be assessed a tax penalty.").

may have inhibited agrivoltaic developments.[139] The updated Massachusetts statute may prevent municipalities from implementing special use permits for agrivoltaic installations.[140] Following Massachusetts's lead, explicit statutory provisions could ease uncertainty and minimize potential deterrents in expanding agrivoltaics' footprint.

On the other side of the policy debate, some states have banned agrivoltaics on various farmlands.[141] For example, New Jersey's pilot program has sought to exclude prime farmland and wetlands from agrivoltaic development.[142] Although these restrictions may negatively impact the development of agrivoltaics more broadly, such developments follow a long and sometimes twisted history of state land use control.[143] State and local governments undoubtedly need to protect their interests, including preserving a community's connection to open space.[144] However, categorical

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139 MASS. GEN. LAWS ch. 61A, § 2A (2022); *see also MA Clean Energy Act Eases Path for Agrivoltaic Projects*, KLAVENS L. GRP, https://klavenslawgroup.com/ma-clean-energy-act-eases-path-for-agrivoltaic-projects/ (last visited May 24, 2024) ("Until passage of the Act, most municipalities required developers and farmers planning to install an agrivoltaic project on farmland enrolled in Chapter 61A to remove the farmland from Chapter 61A before installing the solar project. Removal of farmland from Chapter 61A requires a farmer to notify the host municipality of the farmer's intent to remove the land from classification and to pay the municipality so-called 'roll-back taxes' in connection with this removal. In addition, the notification requirement triggers the local municipality's option or right of first refusal to purchase the farmland.... Occasionally local residents wishing to derail development of an agrivoltaic project have persuaded the municipality to exercise its option rights, forcing farmers to withdraw their notices of intent and delaying and sometimes preventing agrivoltaic projects from moving forward."); *id.* ("The creation of a safe harbor for SMART ASTGUs will enable farmland on which agrivoltaic projects will be installed to remain enrolled in Chapter 61A, resulting in a significant cost and time savings for farmers and developers wishing to operate such projects on farmland.... It is important to note that Section 2A does not require that the renewable energy generating source be a SMART ASTGU and could apply to a renewable energy facility (including a facility other than a solar energy facility) that qualifies for some other relevant incentive.").

140 *MA Clean Energy Act Eases Path for Agrivoltaic Projects*, *supra* note 139 ("The Act also adds a new subsection (d) to Section 2A of Chapter 61A to ease the permitting path of agrivoltaic projects on farmland. The added subsection provides that renewable energy generating sources located on land used primarily and directly for agricultural or horticultural purposes pursuant to Chapter 61A shall be subject to the provisions afforded to agricultural uses and structures under MGL c. 40A, § 3 . . .. This means that, among other things, municipalities should not be able to require special permits for agrivoltaic projects, nor can local zoning be used to regulate agrivoltaic projects in ways that would not be allowed for other agricultural uses and structures.").

141 *See generally* Elizabeth Weise & Suhail Bhat, *Across America, clean energy plants are being banned faster than they're being built*, USA TODAY (Feb. 6, 2024, 3:56 PM), https://www.usatoday.com/story/news/investigations/2024/02/04/us-counties-ban-renewable-energy-plants/71841063007/ (showing states' hesitation to adopt wind and solar plants on farmland); *see also* N.J. BD. PUB. UTILS., *supra* note 99, at 7 (highlighting one state that has chosen to ban agrivoltaics development in particular).

142 N.J. BD. PUB. UTILS., *supra* note 99, at 7.

143 *See, e.g.*, George S. Wehrwein, *Public Control of Land Use in the United States*, 21 J. FARM ECON. 74, 74 (1939); Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 390 (1926).

144 KOLBECK-URLACHER, *supra* note 84, at 12 ("It is wise to consider that 100% of land may not be able to be integrated into dual-use. Setting overly strict guidance could deter development if prescriptions are not feasible. Instead, requiring a percentage of land to be used for dual-use

prohibitions and a lack of cohesion among jurisdictions may pose a risk when local governments are unsure how to regulate agrivoltaics.[145] One study that interviewed solar developers found cross-sector regulation especially burdensome on agrivoltaic projects as the practice is new, and government agencies are unequipped to handle newfangled developments.[146] There are many technical and social reasons why an agrivoltaic project may not work for a certain community.[147] Although there can be community contention regarding solar energy broadly and with siting renewable energy on farmland, a suggestion to bypass local siting practices is not a viable solution.[148] Local governments should instead be called upon to create educational materials for agrivoltaics,[149] perhaps in association with university extension programs, to promote the development of dual-use solar. Local governments also have the power to effectively involve stakeholders throughout the process of securing agrivoltaic developments,[150] which may

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purposes introduces a level of flexibility while ensuring that the original intent of the usage policy is preserved.”).

145 Moore et al., *supra* note 58, at 5 (“Developer interviewees generally thought state authority would avoid local gridlock, whereas local government interviewees believed states forcing them into land-use decisions would inflame tensions.”).

146 Pascaris et al., *supra note 67*, *at* 7 (“Participants flagged the importance of the regulatory context associated with solar development on farmland and alluded to its implications on the success of agrivoltaics. The challenges of cross-sector regulation that agrivoltaics require is effectively translating to greater burden for industry actors, which is making development politically infeasible.... The uncertainty of action and misalignment of agencies when it comes to regulating agrivoltaics is a key challenge that is complicating industry adoption. From a developer perspective, the increased time and energy allocated to navigating regulatory hurdles is interpreted as increased soft costs, which further reduces the value of agrivoltaics. These findings suggest more attention towards enhanced regulatory capacity to manage this cross-sector innovation is important, which could play an enabling role in industry adoption.”).

147 *See generally* JORDAN MACKNICK ET AL., THE 5 CS OF AGRIVOLTAIC SUCCESS FACTORS IN THE UNITED STATES: LESSONS FROM THE INSPIRE RESEARCH STUDY 9 (2022) (highlighting the recommended factors of a successful agrivoltaic project).

148 Moore et al., *supra* note 58, at 5 (Local governments already have much to consider when it comes to solar energy development, one group “surmise[d] that rural local governments' interest in revenue might compete with community members' desires for land to remain in agricultural production.”); Pascaris, *supra* note 74, at 8 (“To build upon this initial Legal Framework Analysis, future research needs to consider the potential justice concerns related to states preempting local zoning decisions to advance agrivoltaics. Finding a just solution that advances agrivoltaics without harming or disempowering agricultural communities will be critical. Given the limited technical capacity of local governments, future research could assess if state-level zoning enabling laws are more well-suited to guide agrivoltaic development in comparison to local land use policy. As agrivoltaic development becomes more commonplace, justice implications such as threats to existing agricultural interests or effects on rural electrification must be considered in full.”).

149 Brunswick & Marzillier, *supra* note 82, at 177 (“… rural local governments could also use public education initiatives and green marketing to help increase such acceptance within their jurisdictions.”).

150 *Id*. at 177-78 (“Local governments have long been integral in regulating and installing distributed renewable generation. This long history of locally-driven zoning makes local governments better situated to address community wants, needs, and priorities. Community-driven renewable energy initiatives have proven to be successful in other contexts, and increasing engagement with local

be especially important for counties with limited solar development experience.[151] Options include modifying zoning codes to openly allow for agrivoltaics[152] or establishing overlay districts as a way for local governments to support the development of agrivoltaics.[153] This approach provides local governments an "opportunity for strategic siting of agrivoltaics in their jurisdiction."[154]

In addition to community needs and taxation concerns, farmer/landowner considerations require similar forethought with respect to contracts and insurance products.[155] For example, a lease versus ownership approach to solar installation involves tradeoffs such as reduced flexibility in farming practices.[156] In the solar grazing context, shepherds may consider the costs and benefits of hosting a solar site on their farmland versus grazing sheep on a rented solar site. If selecting an off-site operation, liability insurance[157] and contract terms[158] with the solar site owner should be established in advance to minimize uncertainty for both parties.

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citizens and earning their support could similarly help to reduce local resistance to agrivoltaics projects.").

151 Salma Elmallah & Joseph Rand, *"After the leases are signed, it's a done deal": Exploring procedural injustices for utility-scale wind energy planning in the United States*, 89 ENERGY RSCH. & SOC. SCI. 1, 9 (2022) (Recommendations for wind development planning to ensure procedural justice at the local level included "[p]rovide additional information and legal resources about project permitting and negotiations for counties or townships without a history of power permitting" and "[c]reate participation opportunities and resources that address resident concerns in relation to livelihood, landscape, and property/ownership types.").

152 Brunswick & Marzillier, *supra* note 82, at 159 ("Local governments also have the power to incentivize agrivoltaics development by modifying their zoning codes to unambiguously allow for agrivoltaics, thereby reducing the soft costs of installation.").

153 *Id*. at 176 (Even local governments could help to encourage agrivoltaics' growth by creating agrivoltaics overlay zones and by removing zoning-related barriers to agrivoltaics development.").

154 Pascaris, *supra* note 74, at 7 ("Even local governments could help to encourage agrivoltaics' growth by creating agrivoltaics overlay zones and by removing zoning-related barriers to agrivoltaics development.").

155 *See generally Legal and Financial Considerations for Solar PV Systems on Farms*, UNIV. MASS. AMHERST (2024), https://ag.umass.edu/sites/ag.umass.edu/files/fact-sheets/pdf/fs_legal_and_financial_considerations_012524_0.pdf (highlighting the need for farmers/landowners to be concerned about the contractual provisions they agree to).

156 *Id*.

157 Guarino & Swanson, *supra* note 87, at 22 ("Another challenge prospective solar grazing farmers must consider is the cost of liability insurance. Because solar sites are such valuable assets, solar developers will generally want to carefully review potential contracts that bring a third party onto the site.").

158 MACKNICK ET AL., *supra* note 147, at 53 ("For grazing sites, roles and responsibilities related to water access, fence maintenance, and other factors should be clear from the beginning. Written agreements can help ensure that roles, responsibilities, and expectations are clear across all partners, which can help each partner fulfill their duties").

IV. AGRIVOLTAIC POLICY DEVELOPMENTS IN ILLINOIS: A MIDWESTERN CORN BELT PERSPECTIVE

The states discussed in section III, except for Colorado, are in the Northeastern region of the U.S. with sharply different agricultural land use profiles than Midwestern corn-belt states.[159] As the introduction notes, Illinois is one of the leading corn and soybean-producing states with a vast agricultural infrastructure.[160] Illinois also has tremendous energy demand, ranking as the 5th largest energy-consuming state in the nation.[161] With a storied coal mining history,[162] the state's rapid transition to an energy supply with increasing shares of renewable sources has been remarkable.[163] As discussed in more detail below, various state programs are in place to facilitate additional solar energy production, including agrivoltaics.[164]

On the research side of agrivoltaics, the University of Illinois leads the USDA-funded Sustainably Co-locating Agricultural and Photovoltaic Electricity Systems (SCAPES) project to explore the potential of agrivoltaics in the Midwest.[165] As the state simultaneously pushes for the expansion of solar energy and the protection of agricultural land, the SCAPES project goals reflect this conflicting policy environment.[166] Findings from the project related to the role of economics and policy may serve as a guide for Midwest-focused agrivoltaic regulatory considerations.

In addition to research, several state agencies and legislative initiatives promote the expansion of agrivoltaics.[167] The Illinois Power Agency's (IPA) Adjustable Block Program administers the development of community solar projects within the state.[168] Community solar is a means for individuals to fund solar installations somewhere within their utility's service area without having to install solar panels on their residence either due to cost, insufficient

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159 Brian Boyce, *5 major regional agricultural belts in the U.S.*, AG DAILY (Apr. 13, 2023), https://www.agdaily.com/insights/major-regional-agricultural-belts-in-us/.

160 *Illinois Farmland is the Envy of the World—We Had Better Protect It*, *supra* note 1; Stiers, *supra* note 1.

161 *Illinois State Energy Profile*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/state/print.php?sid=ILhttps://www.eia.gov/state/print.php?sid=IL (last visited Apr. 4, 2024).

162 Abigail Bobrow, *Built on Coal*, STORIED (Oct. 4, 2021), https://storied.illinois.edu/built-on-coal/.

163 Courtney Lindwall, *Illinois Shows Us What the Road to Clean Energy Should Look Like*, NAT'L RES. DEF. COUNCIL (Dec. 2, 2021), https://www.nrdc.org/stories/illinois-shows-us-what-road-clean-energy-should-look.

164 *See Research—Agrivoltaics Project*, UNIV. ILL. URBANA-CHAMPAIGN, https://scapes.illinois.edu/research/ (last visited Apr. 4, 2024); *see also Welcome to the Illinois Power Agency (IPA)*, ILL. POWER AGENCY, https://ipa.illinois.gov/ (last visited Apr. 4, 2024).

165 *Research—Agrivoltaics Project*, supra note 164.

166 *Id*.

167 *See Welcome to the Illinois Power Agency (IPA)*, supra note 164; *see also Community Solar in Illinois*, CITIZENS UTIL. BD., https://www.citizensutilityboard.org/community-solar-illinois/ (last visited Apr. 4, 2024).

168 *Welcome to the Illinois Power Agency (IPA)*, supra note 164.

space/sunlight, or because they live in a multi-family dwelling.[169] Proposed community solar projects are scored and placed on a priority waitlist for development as state funds become available.[170] If a proposed community solar project makes a commitment to utilizing agrivoltaics, the project will receive one point in the Built Environment category.[171] A project needs at least five points to be eligible for placement on the development waitlist.[172]

The IPA defines agrivoltaics as "[a] dual-use configuration where solar photovoltaic energy generation and agricultural production (crops, livestock, and livestock products as defined by 505 ILCS 5/3.02) are directly integrated and simultaneously producing within the footprint of the project. At least 50% of the project footprint must feature agricultural production at the time of project energization."[173] Beekeeping is not an option for qualifying as an agrivoltaic development under the program, but there is a separate opportunity for a pollinator-friendly habitat designation, which provides an additional point for project scoring.[174]

Community Solar applications seeking to qualify as an agrivoltaic operation must satisfy several criteria related to the preservation of agricultural productivity and soil health throughout the lifetime of the system, continued agricultural use throughout the growing season, a plan for decommissioning to restore the land, and annual reporting requirements on crop production or animal grazing outcomes. [175]

Although not a direct financial incentive for agrivoltaics like the SMART program or New Jersey's Dual-Use Solar Energy Pilot Program, the added point option for the adoption of agrivoltaics in community solar projects in Illinois is a significant private incentive for the development of dual-use solar. Moreover, the minimal design requirements in Illinois for qualifying as an agrivoltaic installation will allow for the continued research and development of dual-use projects to fit different forms of agriculture—from row crops to specialty products. The IPA additionally permits changes to agrivoltaic and pollinator-friendly plans during two stages of the

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169 *Community Solar in Illinois*, *supra* note 167. The 2016 Future Energy Jobs Act, Illinois Public Act 99-0906, as amended by the 2021 Climate and Equitable Jobs Act, Illinois Public Act 102-0662, created the community solar program in Illinois in which subscribers receive a credit on their electricity bill equal to the output of their share of energy created by the community solar installation. *Id.*

170 ILLINOIS SHINES, PROGRAM GUIDEBOOK (2023).

171 *Id*.

172 *Id*. at 151.

173 ILLINOIS SHINES, *supra* note 170, at 119 ("Sited on Conservation Opportunity Areas as defined by the Illinois Department of Natural Resources. []Subtract 2 points, unless the project received points for 1.d. *and* is sited in an Environmental Justice Community, an R3 area, and/or on a brownfield site, contaminated land, disturbed land, or rooftop or other structure[.]").

174 *Id*. at 167 ("[A] project may receive points for both agrivoltaics as well as pollinator friendly habitat[.]").

175 *Id*. ("[A] project may receive points for both agrivoltaics as well as pollinator friendly habitat[.]").

application process, which may allow for innovation as the technical and economic understanding of agrivoltaics expands.[176]

To adjust for the uncertainty and newness of agrivoltaics as a practice, the IPA established a 50% agricultural production project footprint, reserving the right to increase the footprint in the future.[177] Questions have arisen about applying the 50% footprint to grazing operations; the IPA has stated that grazing is not a constant practice and that it must comply with the submitted agrivoltaics plan.[178] The IPA additionally "decided at this time not to take any steps that would prohibit the conversion of agricultural crop land to

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[176] *Id*. at 125 (Permitted Changes Between Part I and Part II Application i. Agrivoltaics 1. Changes to an agrivoltaics plan, such as a change in crop utilization or footprint size (above the required 50% outlined in Appendix A), are permitted. Any changes to an agrivoltaics plan that occur between the Part I and Part II application must be made in writing via an updated plan to the Program Administrator. ii. Pollinator Friendly Habitat 1. Changes to a Pollinator Friendly Habitat plan, such as a change in crop utilization, are permitted. Any changes to a Pollinator Friendly Habitat plan that occur between the Part I and Part II application must be made in writing via an updated plan to the Program Administrator).

[177] *Rationale Document—Traditional Community Solar Scoring Approach*, ILL. POWER AGENCY, https://illinoisabp.com/wp-content/uploads/2022/10/TCS-Scoring-Rationale_October72022.pdf (last visited Apr. 4, 2024) ("The Agency received a significant number of comments regarding the project footprint threshold, with a majority of those commentors recommending that the IPA reduce the dual-use threshold from 75% to 50% of the project footprint. The Agency agrees that the novelty of the agrivoltaics industry, coupled with higher construction and maintenance costs for such projects, necessitate a lower footprint to encourage an uptake in participation…. The IPA may elect to increase the footprint in the future if it is determined that the 50% threshold is easily achievable and results in a significant uptake of agrivoltaics.").

[178] ILLINOIS SHINES, *supra* note 170, at 166-67 ("How will the IPA require proof that 50% of the footprint of an array is being used for grazing? The Part I application must include a description demonstrating the planned agricultural use of the site, and explanation of the viability of that use, and an accompanying attestation of the intent to utilize agrivoltaics throughout the lifetime of the REC contract. Firm demonstration of active agricultural use (such as grazing) is required at Part II. Documentation at Part II should include proof that agrivoltaics plan was followed, or any updates made to the plan through development of the site for grazing. Agrivoltaics plans submitted in the Part I application should include documentation described in Appendix B of the October 2022 version of the Program Guidebook. Please review details on a permissible agrivoltaics plan, including grazing requirements, in Appendix B of the Program Guidebook. For the purposes of grazing, the Agency understands that round-the-clock grazing is not the norm and animals occasionally must be relocated in order to allow for grazed material to grow. A schedule/plan that outlines the times the herd will/will not be grazing should be outlined within the agrivoltaics plan. Additional aspects of grazing operations that could be included in the agrivoltaics plan are: information on pasture where grazing will occur on the parcel, information on the amount of land available for grazing, size and type of animals for the grazing herd, information on if one or multiple herds will be utilized, future plans for livestock utilization/sale, what resources are available to the herd (or herds) as is relates to soil condition, plant species the herd will graze on, water resources for herd, barn resources (if herd will remain on site), plans for the herd during winter months, additional diet supplementation for herd (if relevant), grazing system to be used (continuous, rotational, etc.). Please note these are suggestions and should not be used to limit what information should be included in an agrivoltaics plan focus on grazing should the Agency have missed any such part of a grazing operation that might be relevant.").

grazing in order to participate in this manner."[179] From an economic perspective, it is unclear whether farmers will have sufficient incentives to convert from traditional crop production to solar grazing, and therefore, prohibiting the conversation through regulation may not be necessary.

Inspections and reporting are two additional program elements. Projects qualifying for the community solar program will be subject to random inspections and annual reporting throughout the life of the project.[180] Annual reporting and performance align with agrivoltaic program requirements in other states and are important considerations as contracts for a state-funded community solar project can extend up to 20 years.[181]

Including agrivoltaics as part of the Traditional Community Solar Project Selection scoring system demonstrated Illinois' broad acceptance of dual-use solar as a practice. The Illinois Climate and Equitable Jobs Act (CEJA)[182] increased state funding for renewable energy development and stimulated new project proposals.[183] Questions remained, however, for farmers and landowners on whether dual-use solar would change property taxes or trigger zoning compliance and other permitting challenges. The lack of certainty concerning land use restrictions presented significant concerns for project developers, and some local communities considered moratoria or bans on additional renewable energy projects.[184]

In response to growing resistance in some parts of the state, the Illinois General Assembly passed HB 4412, which created statewide zoning and permitting standards for renewable energy projects.[185] The statute mandated

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179 *Rationale Document—Traditional Community Solar Scoring Approach*, *supra* note 178 ("It is unclear to the Agency whether such restrictions are necessary at this time and how such restrictions could be enforced.").

180 ILLINOIS SHINES, *supra* note 170, at 125 ("Two commitments that, if applicable, the Program Administrator will seek to monitor throughout the life of the REC Delivery Contract are scoring criterion Built Environment – Agrivoltaics (1.c) and Built Environment – Pollinator Friendly Habitat (1.d). As both of these criteria are commitments that are to be continued throughout the life of the REC contract, the Program Administrator will request updated reporting at the Annual Report each July and will also seek to ensure that projects that have made these commitments are in compliance via random project inspections.").

181 *Traditional Community Solar*, ILL. SHINES, https://illinoisshines.com/traditional-community-solar/#:~:text=The%20Traditional%20Community%20Solar%20category%20will%20generally%20comprise,front-loaded%20payment%20schedule%20previously%20used%20for%20community%20solar (last visited Apr. 4, 2024).

182 Public Act 102-0662 (Ill. 2021).

183 *See* David L. Rieser & Buck B. Endemann, *Renewables Rule! Illinois Law Sets Uniform Standards for Approval of Utility Wind and Solar Facilities*, K&L GATES (Mar. 13, 2023), https://www.klgates.com/Renewables-Rule-Illinois-Law-Sets-Uniform-Standards-for-Approval-of-Utility-Wind-and-Solar-Facilities-3-13-2023 ("CEJA required the state to be at 100% clean energy by 2050 with deadlines for 40% by 2030 and 50% by 2040. To meet those goals, CEJA more than doubled funding for the RPS and provided more than $40 million in funding for renewable initiatives.").

184 *See id*. ("Recently, some Downstate counties and municipalities began to consider moratoria or outright bans on renewable facilities in an attempt to preserve local land use decision making.").

185 H.B. 4412, 102d Gen. Assemb. 2d Sess. (Ill. 2023).

revision of existing county and municipality ordinances[186] and prohibited local governments from precluding solar and wind development projects so long as they were in compliance with the state standards and other relevant regulations.[187] Localities are also restricted in property value considerations as they "may not require a facility owner to pay into a neighboring property devaluation escrow account."[188]

Additionally, the Act bars counties from adopting "zoning regulations that disallow, permanently or temporarily, commercial wind energy facilities or commercial solar energy facilities from being developed or operated in any district zoned to allow agricultural or industrial uses."[189] In contrast to minimizing restrictions to solar development on agricultural land,[190] the Act further requires "a facility owner … [to] enter into an agricultural impact mitigation agreement with the Department of Agriculture,"[191] likely to protect farmland. In 2023, the Act was updated to require farmland drainage plans from solar energy facilities to ensure impacted drainage systems are considered and restored throughout the construction process.[192] The solar facility owner will be required to "repair or pay for the repair of all damage to the subsurface drainage system" from the construction of the solar energy

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186 55 ILL. COMP. STAT. 5/5-12020(d) (2023); *see also* Rieser & Endemann, *supra* note 184 ("The requirements set forth in this subsection (e) may be waived subject to the written consent of the owner of each affected nonparticipating property…. Counties may allow test wind towers or test solar energy systems to be sited without formal approval by the county board.").

187 55 ILL. COMP. STAT. 5/5-12020(g) (2023); *see also* Rieser & Endemann, *supra* note 184 ("The requirements set forth in this subsection (e) may be waived subject to the written consent of the owner of each affected nonparticipating property…. Counties may allow test wind towers or test solar energy systems to be sited without formal approval by the county board.").

188 55 ILL. COMP. STAT. 5/5-12020(k) (2023); *see also* Rieser & Endemann, *supra* note 184 ("A county may not condition approval of a commercial wind energy facility or commercial solar energy facility on a property value guarantee and may not require a facility owner to pay into a neighboring property devaluation escrow account.").

189 55 ILL. COMP. STAT. 5/5-12020(h) (2023); *see also* Rieser & Endemann, *supra* note 184 ("(k) A county may not condition approval of a commercial wind energy facility or commercial solar energy facility on a property value guarantee and may not require a facility owner to pay into a neighboring property devaluation escrow account.").

190 Rieser & Endemann, *supra* note 184 ("… a county shall not require standards for construction, decommissioning, or deconstruction of a commercial wind energy facility or commercial solar energy facility or related financial assurances that are more restrictive than those included in the Department of Agriculture's standard wind farm agricultural impact mitigation agreement, template 81818, or standard solar agricultural impact mitigation agreement, version 8.19.19").

191 55 ILL. COMP. STAT. 5/5-12020(c) (2023); *see also* Rieser & Endemann, *supra* note 184 ("… a county shall not require standards for construction, decommissioning, or deconstruction of a commercial wind energy facility or commercial solar energy facility or related financial assurances that are more restrictive than those included in the Department of Agriculture's standard wind farm agricultural impact mitigation agreement, template 81818, or standard solar agricultural impact mitigation agreement, version 8.19.19").

192 55 ILL. COMP. STAT. 5/5-12020(j-5) (2023); *see also* S.B. 1699, 103rd Ill. Gen. Assemb., Reg. Sess. (Ill. 2023) ("… commercial solar energy facility shall file a farmland drainage plan with the county and impacted drainage districts outlining how surface and subsurface drainage of farmland will be restored during and following construction or deconstruction of the facility.").

facility as in the agriculture impact mitigation agreement requirements and "compensate landowners for crop losses or other agricultural damages."[193] Additionally, a county may require vegetation management plans for solar energy facilities.[194]

Not surprisingly, Public Act 102-1123 has resulted in community backlash regarding renewable energy siting.[195] For example, the Piatt County Board recently approved the construction of a wind farm through a special-use permit in October 2023 with mixed feelings from residents.[196] This decision came after a referendum issued in April 2023 resulted in 1,498 out of 2,121 individuals voting against the county board permitting wind development in the county.[197] Some of the board members were concerned about state overreach into local government affairs.[198] One board member referenced the nuance of the project as it was the first application to arrive at the approval stage after the new law, mentioning concerns of a lawsuit if the wind farm was not approved: "Piatt County can either have a wind farm constructed for free or Piatt County can pay half a million dollars for the wind farm."[199] Another board member thought it "inappropriate that the board was told by lawyers that they could not take into account what their constituents wanted."[200] Not all comments were negative; there were also discussions

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193 55 ILL. COMP. STAT. 5/5-12020(s-5) (2023); *see also* S.B. 1699, 103rd Ill. Gen. Assemb., Reg. Sess. (Ill. 2023) ("The facility owner shall also compensate landowners for crop losses or other agricultural damages resulting from damage to the drainage system caused by the construction of the commercial wind energy facility or the commercial solar energy facility. The commercial wind energy facility owner or commercial solar energy facility owner shall repair or pay for the repair of all damage to the subsurface drainage system caused by the construction of the commercial wind energy facility or the commercial solar energy facility in accordance with the agriculture impact mitigation agreement requirements for repair of drainage. The commercial wind energy facility owner or commercial solar energy facility owner shall repair or pay for the repair and restoration of surface drainage caused by the construction or deconstruction of the commercial wind energy facility or the commercial solar energy facility as soon as reasonably practicable.").

194 55 ILL. COMP. STAT. 5/5-12020(r) (2023) ("… a county may (1) require a commercial solar energy facility owner to plant, establish, and maintain for the life of the facility vegetative ground cover, consistent with the goals of the Pollinator-Friendly Solar Site Act and (2) require the submittal of a vegetation management plan that is in compliance with the agricultural impact mitigation agreement in the application to construct and operate a commercial solar energy facility in the county if the vegetative ground cover and vegetation management plan comply with the requirements of the underlying agreement with the landowner or landowners where the facility will be constructed").

195 EISENSON, *supra* note 13, at 33-34 (showing how the law overturned two county ordinances to date); *see also County Approves Wind Farm*, PLATT CNTY. J. REPUBLICAN (Oct. 19, 2023), https://www.journal-republican.com/news/county-approves-wind-farm/article_711d05a6-6e9e-11ee-9a75- a7b72bea20a6.html?utm_medium=social&utm_source=twitter&utm_campaign=user-share.

196 *County Approves Wind Farm*, *supra* note 197.

197 *Id*.

198 *Id*.

199 *Id*.

200 *Id*.

about the project's benefits, such as the money the county would receive that could better support public services.[201]

Focusing on agrivoltaics, Public Act 102-1123 could have many positive implications by eliminating potential restrictions on the conversion of farmland. This may ease agricultural producers' ability to host dual-use solar without undue restrictions at the local level. However, as seen in Piatt County, possible community unrest indicates the importance of involving local stakeholders in agrivoltaic project plans.[202] Public perception of agrivoltaics will be key in further establishing projects in Illinois and nationally.[203]

Four other Illinois statutes can potentially impact agrivoltaic project development for land use and environmental concerns. The Renewable Energy Facilities Agricultural Mitigation Act was created to protect landowners and agricultural land "during the construction and deconstruction of commercial renewable energy facilities."[204] Focusing more on agriculture, the Illinois Conservation Enhancement Act encourages "marginal agricultural land" to be taken out of production when the land is highly erodible or affects water resources.[205] The land is instead converted to perennial vegetation through conservation easements.[206] Along with these conservation goals, Illinois has instated the Sustainable Agriculture Act, which provides "funding of the developmental research program that serves production agriculture in Illinois" to account for growing competition in the market and a need for protecting the environment.[207] In addition, the Agricultural Areas Conservation and Protection Act allows land to be classified as an Agricultural Area for ten years to protect the land from other uses and restrictions from local governments.[208] The Act defines what

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201 *Id*.

202 *See generally County Approves Wind Farm*, *supra* note 197 (explaining the importance of protecting the welfare of the community's interests at stake).

203 MACKNICK ET AL., *supra* note 147, at 55 ("Early and extensive communication, discussions, and tours with the surrounding community to convey the goals and potential impacts of an agrivoltaic project can improve the likelihood of project success and support…. The role of the public in solar development and agrivoltaic research cannot be understated. As public opposition to new forms of energy and other development increases, the consideration of a 'social license to operate' rises in importance. Smith and Richards define the social license to operate as an 'ongoing social contract with society that allows a project to both start and continue operating in a community. Social license to operate derives from communities' perception of a company and its operations, comprised of a company's ongoing acceptance and approval from stakeholders (Smith and Richards 2015). Without obtaining or maintaining this social license, there can be continued conflict, controversies, or pushback in many communities."); Alexis S. Pascaris et al., *Do agrivoltaics improve public support for solar? A survey on perceptions, preferences, and priorities,* 2 GREEN TECH., RESILIENCE, & SUSTAINABILITY 1, 6 (Oct. 23, 2022).

204 505 ILL. COMP. STAT. 147/5 (2015).

205 *Id*. at 35/1-2 (2016).

206 *Id*.

207 *Id*. at 135/2 (2001).

208 *Id*. at 5/5 (2022).

constitutes agriculture production to remain as an Agricultural Area and cites the loss of farmland and "urban pressure" as concerns. [209]

Looking beyond the provisions of Public Act 102-1123 that specifically address solar development and farmland, Illinois has various agricultural land use policies designed to protect and promote farmland that also implicates agrivoltaics. For example, the Renewable Energy Facilities Agricultural Impact Mitigation Act was not created for dual-use development but could be interpreted as indirectly supporting solar development on farmland. In acknowledging potential impacts in the construction and deconstruction of renewable energy facilities, the statute implies an understanding that farmland may be converted to energy production and, at some point in the future, rededicated to full agricultural production.[210]

The Illinois Conservation Enhancement Act (ICEA)[211] encourages the retirement of marginal or highly erodible land from agricultural production in favor of perennial vegetation to conserve, protect, and enhance water and land resources.[212] Combining perennial vegetation with solar development in areas encompassed by the ICEA may provide landowners with a secondary income stream from solar energy while preserving more productive agricultural land.[213] The perennial vegetation could also support a pollinator-friendly designation under the Pollinator Friendly Solar Site Act[214] or a solar grazing operation in accordance with the Illinois Solar Site Pollinator Establishment and Management Guidelines issued by the Illinois Department of Natural Resources.[215] More scientific research is needed to analyze the possibility and potential considerations for agrivoltaics on marginal or highly erodible land.[216]

Commentators have noted that the Sustainable Agriculture Act[217] could accelerate agrivoltaic development and research if the experimental practice can be deemed an agricultural production technique, thereby making it

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209 *Id*. at 5/2 (2022).

210 505 ILL. COMP. STAT. 147/10 (2015).

211 *Id*. at 35/1-2 (2019).

212 *Id*.

213 Hannah Jacobs Wiseman et al., *Farming Solar on the Margins*, 103 B.U.L. REV. 525, 526 (2022) ("This Article reframes the key obstacles to climate policy and argues for a solution to the current climate policy impasse. We propose that the next Farm Bill should use the billions of dollars in subsidies that keep marginal farmland out of production to support solar energy production on these lands.").

214 525 ILL. COMP. STAT. 55/1 (2019).

215 *Solar Site Pollinator Establishment and Management Guidelines*, ILL. DEP'T NAT. RESOURCES (Apr. 6, 2023), https://dnr.illinois.gov/content/dam/soi/en/web/dnr/conservation/pollinatorscorecard/documents/SolarSitePollinatorEstablishmentManagementGuidelines.7.13.23.pdf.

216 Matteo Cavallito, *Solar farms may encourage soil erosion in U.S.*, RESOIL FOUNDATION (Sept. 7, 2023), https://resoilfoundation.org/en/environment/us-solar-farms-erosion/ (noting that researchers at Virginia Tech will analyze soil erosion risks associated with solar energy installations).

217 505 ILL. COMP. STAT. 135/1 et. seq. (2001).

eligible for state funding.[218] Specifically, agrivoltaics may fall under the Act's mandate to support research that determines "the optimum methods for production agriculture which result in the best return for the farm and best preserves the environment and the farmland of Illinois."[219] Dual-use solar could provide additional income to farmers, and some results suggest that agrivoltaic systems can reduce irrigation needs—a research topic for the aforementioned SCAPES project.[220]

On the other hand, the Agricultural Areas Conservation and Protection Act[221] may restrict the ability of landowners with enrolled property to participate in dual-use practices due to the risk of falling out of the Act's restrictive definition of agricultural production and crops, livestock, and aquatic products.[222] Before agrivoltaics become prevalent, the state should consider enacting a provision permitting dual-use solar. Continuing agricultural production underneath the solar panels with dual-use systems would serve the underlying purpose of the statute, to prevent full-scale conversion to urban sprawl.

Aside from general land use and agricultural production statutes, it is important to consider farmland taxation. According to the Illinois Department of Revenue, "[f]armland is assessed based on its ability to produce income (its agricultural economic value)."[223] To achieve farm designation under the statute, the property must be "used solely for the growing and harvesting of crops; for the feeding . . . of livestock," and other traditional agricultural activities.[224] It is unclear whether agrivoltaic development will prohibit agricultural land from qualifying for farmland assessment. Solar panel construction could fall under the provision that "[i]mprovements, other than farm dwellings, shall be assessed as a part of the farm and in addition to the farm dwellings when such buildings contribute in whole or in part to the operation of the farm."[225] The uncertain treatment of agrivoltaics in the property tax context introduces yet another layer of complexity to solar energy expansion. To the extent Illinois or other states seek to develop an agrivoltaics incentive program, clarifying its status as farmland for tax assessment purposes should be a priority.

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218 JESSICA GUARINO & TYLER SWANSON, INTRODUCTION TO AGRIVOLTAICS IN ILLINOIS: POLICY AND REGULATORY GUIDE 30 (2023).

219 505 ILL. COMP. STAT. 135/2 (2001).

220 *Research: Exploring a Next-Level Ecosystem,* U. ILL. URBANA-CHAMPAIGN, https://scapes.illinois.edu/research/ (last visited Apr. 5, 2024).

221 505 ILL. COMP. STAT. 5/1 (2024).

222 GUARINO & SWANSON, *supra* note 219, at 27.

223 *How is Farmland Assessed for Property Tax?*, ILL. REVENUE, https://tax.illinois.gov/questionsandanswers/answer.319.html (last visited Apr. 5, 2024).

224 35 ILL. COMP. STAT. 200/1-60 (2024).

225 *Id*.

V. CONCLUDING THOUGHTS AND FUTURE OUTLOOK

Illinois, like many states, faces a wide range of policy priorities.[226] As priorities evolve, legislative responses inevitably result in some level of conflicting incentives and regulatory signals.[227] Land use change and entitled perspectives on private property rights add to the complexity of aligning law, implementing regulations, and public acceptance. Conceptually, a policy of protecting its highly productive agricultural land from the encroachment of suburban sprawl aligns with environmental and agricultural interests. However, when a second policy priority—renewable energy—is introduced, the uneasy environmental-agricultural alliance concerning land use is stressed. Agrivoltaics may provide a narrow path forward by rebuilding and strengthening an agro-environmental collation for land use.

A proposed Agricultural Drought and Climate Resilience Office that gives "preference to grant applications that propose using grant money to conduct a new or ongoing demonstration or research project as a means to study the potential, benefits, and tradeoffs of agrivoltaics in the State" is one potential step forward.[228] As a leader in the Midwest region for both agricultural and renewable energy production, Illinois is well positioned for future research to determine from an agronomic perspective what agrivoltaic systems work best for different soil classifications and adaptability for different communities,[229] as well as a policy innovation, to support industry adoption of agrivoltaics.[230] Potential examples include a dedicated RPS

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226 *See generally* Brett Chase & Dan Gearino, *Illinois' Signature Climate Law Has Been Slow to Fulfill Promises for Clean Energy and Jobs*, INSIDE CLIMATE NEWS (Sep. 22, 2023), https://insideclimatenews.org/news/22092023/pritzkers-climate-laaw-behind-on-jobs-renewables/ (showing the issues Illinois faces with implementing clean energy); *see generally* EISENSON, *supra* note 13, at 1.

227 *Compare* Brunswick & Marzillier, *supra* note 82, at 166, *with* EISENSON, *supra* note 13, at 1.

228 H.B. 4155, 103rd Gen. Assemb., Reg. Sess. (Ill. 2023 & 2024).

229 Brunswick & Marzillier, *supra* note 82, at 164 ("One other potentially valuable product of expanded agrivoltaics research is a set of clearer and more scientifically-supported definitions and standards for policymakers to integrate into agrivoltaics-focused government incentive programs…. Ideally, any such definition would also preserve some flexibility for states and localities to make adjustments based on localized variations…. Beyond a basic general definition, federal policymakers armed with greater scientific knowledge about agrivoltaics could ultimately also craft more specific standards and definitions encompassing the many relevant factors impacting the effectiveness of agrivoltaics projects."); *see also* Pascaris et al., *supra* note 67, at 9 ("Industry actors stressed how the "liability of newness" of agrivoltaics is the key barrier to adoption, therefore accelerated R&D is needed to mitigate uncertainty and remove unknowns for industry actors and farmers alike. Programs and policies that increase funding for agrivoltaic research and demonstration could stimulate learning processes and adoption; government funding for more open-source research on crop productivity across geographic regions, optimal design specifications, implications of panel transparency, microclimatic impacts on photovoltaic electricity production, modeling and data validation, soil health, and more, is necessary at this phase in the development of agrivoltaics.").

230 An incentive will be imperative for the development of agrivoltaics projects in the state. Pascaris et al., *supra* note 167, at 6 ("While environmental, social, and political factors do impact project

carve-out for agrivoltaics,[231] an agrivoltaic feed-in-tariff program modeled on Massachusetts's SMART initiative,[232] and a voluntary labeling/green marketing program.[233] An interactive and integrative "task force" for agrivoltaic development could also aid interagency jurisdictional overlaps and coordination problems at the state level, as well as serve as a clearing house to promote localized extension efforts.[234] The development of agrivoltaics may be in the early stages, but this does not mean that governments should not take action to prepare for its arrival, especially in states such as Illinois, that are driving cutting-edge agrivoltaic research at the university level.

At its core, agrivoltaics is about keeping agricultural land in production and developing a greener energy infrastructure.[235] As acceptance of agrivoltaics grows, it will also be imperative to involve communities at the local level to ensure stakeholder involvement and public acceptance. Fortunately, due to its abundance of natural resources consisting of productive soil, sufficient rain, and ample sunlight, Illinois is uniquely

success and influence agrivoltaic adoption, economic factors are the strongest drivers.... The presence of market mechanisms was identified to have a positive impact on the adoption of agrivoltaics; whereas the absence of market mechanisms was discussed as a critical need that would address the core barrier of adoption: perceived high costs."). In one article, authors "highlight policy as an especially vital driver because it can directly address the challenges to industry adoption identified – policy can help shape markets (through price improvements), and it can stimulate innovation (through learning processes that improve performance)." *Id.*

231 Brunswick & Marzillier, *supra* note 82, at 169 ("State policymakers could promote agrivoltaics development within their jurisdictions by introducing special RPS carve-outs or multipliers for agrivoltaics-generated power.").

232 Pascaris et al., *supra* note 67, at 6 ("The implementation of a feed-in tariff could most effectively reconcile any additional capital costs, which not only enhances the perceived economic feasibility of grivoltaics for solar companies but could also translate to a higher lease payment to farmers.").

233 Brunswick & Marzillier, *supra* note 82, at 179 (Municipal governments can also cultivate community interest in new technologies such as agrivoltaics through green marketing programs designed to raise awareness of and demand for agrivoltaics projects.... Voluntary labeling programs for food products and electricity produced within agrivoltaics projects could similarly help to increase demand for these projects. Labeling produce as agrivoltaics-grown or allowing businesses to advertise that they use agrivoltaics-generated electricity would raise public awareness and demand, creating an incentive for grocery stores and utility companies to supply their customers with these products.").

234 Pascaris et al., *supra* note 67, at 6 ("Regional working groups and task forces appointed to facilitate information exchange, curate best practices, define standards, and provide directionality for regulators could alleviate current interagency struggles to manage agrivoltaic permitting and program administration.... Further, our research demonstrates a need for state funding to establish agrivoltaic task forces and interagency staff positions, and boost University Extension technical assistance capacity.").

235 *See generally* Michele Boyd, *The Potential of Agrivoltaics for the U.S. Solar Industry, Farmers, and Communities,* SOLAR ENERGY TECH. OFF. (Apr. 17, 2023), https://www.energy.gov/eere/solar/articles/potential-agrivoltaics-us-solar-industry-farmers-and-communities (explaining the need for agrivoltaics in order to maintain a better energy infrastructure).

positioned to lead the deployment of this innovative approach to joint agricultural and energy production.[236]

[236] *Illinois is Home to Abundant Natural Resources*, THE CAUCUS BLOG, https://www.thecaucusblog.com/2023/08/illinois-is-home-to-abundant-natural.html (last visited Apr. 21, 2024).