

LIGHTSTAR

Agrivoltaics for New Jersey Pinelands Farmers

July 19, 2023



Meet the Team



Lucy Bullock-Sieger

VP of Strategy



Kelly Buchanan

Policy Manager



Lightstar's Agrivoltaic Commitments

- Working with farmers and farm managers to understand dual-use and how to leverage it for farm viability, food system stabilization, ecological benefits.
- Prioritizing sustainable siting and development practices and being an engaged member of the conservation and research community.
- Providing resources, support, and opportunities for farming families.
- Ensuring valuable farmland stays in production.

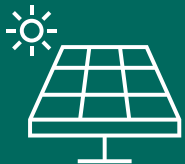
New Jersey Dual-Use Legislation



1. Enables up to 200MW of agrivoltaic (AgPV) solar in New Jersey during a pilot program lasting 36 months, a 12 month extension and an additional 50MW may be made available. After which, the legislation stipulates that a permanent AgPV program will be implemented. Rules were to be est'd December 2021, now 2023.



2. Allows up to 10MW of solar on prime, non-preserved farmland with the ability to retain the farmland tax assessment if it remains in production. Prime and SWI soil projects must be enrolled in a research study.



3. Prohibits siting in the area of the Pinelands unless a waiver is granted by Secretary of Ag, Department of Environmental Protection, and the project is consistent with the character of the parcel.



Intro to Agrivoltaics

“Energy generation facilities, structures, and equipment for the production of electric power from solar photovoltaic panels located on unpreserved farmland in agricultural or horticultural production that ensures the continued simultaneous use of the land below and adjacent to the panels for agricultural or horticultural production.” – NJ Dual Use Solar Act C.48:3-87.13, section h.

- The land is **restricted to remain in agricultural production** through the life of the project, often 20 years or more. Retaining farmland tax assessment and subject to BPU compliance.
- Acceptable agricultural or horticultural activity is **defined by existing statute** and farmland tax assessment acceptable use.
- **Lease payments and a portion of any available incentives (stipend) are paid to the farmer** for the life of the project (20+ years) to ensure agricultural activity and support farm viability.

Latest Solar Crop Research

Arizona – Hardiness zone 8a

Tomatoes fruited more, and peppers **fruited 3x more** than in an open field. Additionally, dual-use grown crops were **less water stressed** than in open fields under equal water conditions, when water was decreased by 50% in the dual-use crops – there was no reduction in food production.

Illinois – Hardiness zone 5a-7b

In studying system designs – potential that in times of heavier precipitation dual-use systems could **protect plants**.

Colorado – Hardiness zone 3a-7a

First commercial dual-use project had a successful harvest – 8,600 lbs in half a season, **saving on water use**, and profiting from CSA. Research outcomes forthcoming.

Massachusetts – Hardiness zone 5a-7a

Conducting research since 2011 – the first dual-use project in the nation. Peppers, broccoli, kale, and swiss chard all **saw the same or greater yield** despite a record dry and hot summer in 2017.



National Agrivoltaic Project Examples





Hayfield to Vegetables in One Season

- Planted July 2021, harvested 8,600 under a slightly modified single-axis tracking array.
- Successful harvest with over 25+ varieties
- Owned operated by Jack's Solar Garden Developments
- 1.2 MW of solar powering over 300 homes, 5 acres.



Jack's Solar Garden – Longmont Colorado
with Sprout City Farm Workers

A photograph showing a solar farm installed in a grassy field. Several cows are grazing under the solar panels. The sky is blue with some clouds. The solar panels are mounted on black poles and are arranged in rows. The cows are of various colors, including white with black spots and brown. The field is lush green with some purple flowers.

Cattle + Solar – University of Minnesota

- Reduced heat stress in cattle
- Increased well-being of livestock
- Developed by the University of Minnesota

Lightstar Agrivoltaic Project Examples

Wappinger, NY – 2.1 MWAC, 15 acres



Thompson Family Farm

- Historically a hay field, family wants to expand production
- 2 acres of blueberries
2 acres of strawberries
6 acres of squash
- Developed by Lightstar Renewables and construction set to begin September 2023

Freeland, MD – 3 MWAC, 15 acres

Phillips Family & Tennant Farmer

- Same landowner and tenant farming family since 1900. Historically used for soy, and soy production will continue with the array wide enough for a combine.
- Developed by Lightstar Renewables, permits Summer 2023

Montgomery, NY – 2.5 MWAC, 15 acres

DiMartino Family

- Historically a hay field
- 1 year of hay, transitioning to vegetables
- Pumpkin production in between seasons
- Developed by Lightstar Renewables and construction set for Winter 2023

Next Steps for the Pinelands



NJ AgPV Stakeholders

Working together since Fall of 2021, stakeholders have been collaborating on principles of an AgPV program and DOE implementation funding:

- Coalition for Community Solar Access (CCSA)
- New Jersey Farm Bureau (NJFB)
- American Farmland Trust (AFT)
- Rutgers University Agrivoltaic Research and Extension Program (Rutgers)
- Duke Farms
- New Jersey Conservation Foundation
- NJ Board of Public Utilities

Additional Information: What is needed for responsible AgPV?

- **Definition of AgPV** The technical definition of Agrivoltaics should follow the [Fraunhofer ISE's guidance](#). Municipalities can use the state definition for acceptable agricultural use in each state. Although apiaries and pollinators can be considered dual-use, LSR does not consider it agrivoltaics or “solar farming.”
- **Ensuring a project remains in production** Developers should pay a meaningful stipend to the farmer for keeping the land in production. Utilize the tax assessment or similar for compliance. Cure periods, similar to other agricultural programs, should be allowed for projects that have fallen out of compliance due to extreme weather, crop failure, drought, and other typical agricultural challenges. Site plan approval can be revoked if project is not farmed.
- **Farm Logistics Plan** should be completed in direct consultation with the farmer or farm manager, and an agricultural extension agent and/or equipped third parties (NRCS conservation planner). Should be required for site plan approval.
- **Clear Construction Guidelines** these may include soils being tested for Ph levels, nutrients, etc. before and after construction. Engineering, procurement and contracting firms (EPCs) must have proper soil compaction practices outlined in the specs of each project. (NY State has excellent ones)
- **Decommissioning of Projects** includes soil testing, top soil treatment, and removal of all solar system materials, unless determined that some materials would be beneficial to the farming operation.
- **Agricultural Fencing** should be an acceptable option for all zoning purposes and is in line with federal electric code, as it preserves the rural character of the farm and lends an added benefit to farmers by keeping wildlife away from crops.
- **Setbacks for Operation** towns should consider the total farming operation and adjusting setbacks to allow for maneuvering of necessary farm equipment, while maintaining necessary screening.

Allowing for AgPV

Initial considerations for amendments needed to the Comprehensive Management Plan, Section 7:50-5.36:

1. Dual-use projects shall be a permitted solar energy facility. "iv. On a parcel that operates in a dual-use capacity through the simultaneous use of the parcel for an agricultural or horticultural purpose and the installation and operation of a solar energy facility that produces solar energy. "
2. Dual-use facilities would be allowed on prime soils and on active agricultural operations. Farmers need productive soils to produce crops.
3. Stipulating that dual-use facilities shall not remove more than 2 acres of trees for access roads and utility distribution infrastructure.



AgPV Resources

Additional Information: Resources for AgPV

[Arenas-Corraliza et al., 2019. *Wheat and barely can increase grain yield in shade through acclimation of physiological and morphological traits in Mediterranean conditions*](#)

[Tazawa, 1999. *Effects of Various Radiant Sources on Plant Growth*](#)

[UMass Extension, 2019. *Expectations for Cranberry Growth and Productivity under Photovoltaic Panels*](#)

[Fraunhofer Institute for Solar Energy Systems, 2018. *Agrophotovoltaics: High Harvesting Yield in Hot Summer of 2018*](#)

[Adeh, Selker, & Higgins, 2018. *Remarkable agrivoltaic influence on soil moisture, micrometeorology, and water-use efficiency.*](#)

[Barron-Gafford et. al., Nature 2019 *Agrivoltaics provide mutual benefits across the food-energy-water nexus in drylands*](#)

[Outline of 2020-2021 Research Findings By Professor Greg Barron-Gafford, Arizona State University](#)

[Laub et. al. Agronomy for Sustainable Development 2022, *Contrasting yield responses at varying levels of shade suggest different suitability of crops for dual land-use systems: a meta-analysis*](#)

[Potenza et. al. Agrivoltaic System and Modelling Simulation: A Case Study of Soybean \(Glycine max L.\) in Italy](#)

[Growing Crops Under Solar Panels? Now There's a Bright Idea](#)

[American Farmland Trust Dual-Use Resources](#)

[Agrivoltaic Research and Resource Clearinghouse](#)

[NREL 5 C's of Agrivoltaic Development](#)

LIGHTSTAR