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U.S. DEPARTMENT OF ENERGY


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Agrivoltaics Pathway


This guide provides an overview of the site-specific planning and implementation steps needed to build an agrivoltaic project on your farm.

During the planning phase, it is important to complete and/or familiarize yourself with:


 **Farm assessment.** Every parcel of land is different, so site-specific data are needed to ensure that the photovoltaic (PV) system design and project goals are appropriate and aligned. Data can include site size, ground slope, current land use, local climate conditions (e.g., temperature, irradiance, soil, humidity, precipitation), availability of supplemental irrigation water, current and/or desired agricultural systems, on-farm energy use, and distance to nearest grid interconnection point.


 **PV feasibility study.** Different agrivoltaics designs will impact the cost and feasibility of your agrivoltaic project. A comprehensive study is needed to understand the economic viability of agrivoltaics for your specific farm. This study is important in making sure your desired agricultural activities are compatible with your PV system design.

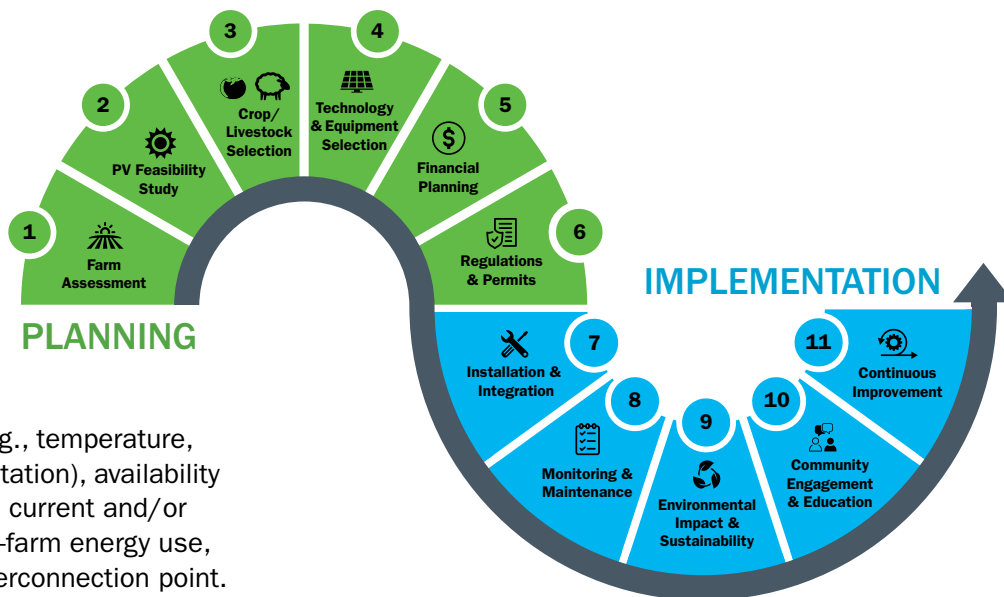
 **Crop/livestock selection.** Agrivoltaic crop compatibility depends on a variety of factors, including PV system design (e.g., height, space between panels, etc.), PV technology type, local climates and soils, sunlight availability, crop shade tolerance, crop height, and project goals. Appropriate livestock integration can affect wire management and site safety, panel heights, fencing, and need for onsite water.

 **Technology and equipment selection.** Discuss with a solar developer to research and select high-quality solar panels, inverters, and other required equipment from reputable suppliers. Consider factors like availability, cost, durability, efficiency,


and warranty coverage. Provide site-specific farming and climate conditions to ensure compatibility with the farm's electrical infrastructure.


 **Financial planning.** You will need to work with a solar developer to get an estimate of the initial investment required for installing solar panels and associated equipment, including inverters, mounting structures, and wiring. This upfront cost will be balanced by potential long-term savings and revenue generation from energy production and continued crop sales.


 **Regulations and permits.** Permits can have a large impact on the timing of solar installation, so familiarize yourself with local regulations, permits, and zoning requirements for solar development on agricultural land. Check if there are any restrictions on land use or potential incentives for adopting renewable energy. A solar developer will work with you to obtain necessary approvals from relevant authorities.




During the implementation phase, it is important to incorporate and/or understand:

 **Installation and integration.** Work with a solar developer to layout specific guidelines for installation. This may include timing installation around agricultural activities, prioritizing low-impact development practices to minimize soil compaction, or identifying areas for equipment laydown. Advocate for what works best for your land.

 **Monitoring and maintenance.** Develop a formal operations and management (O&M) plan for the site to ensure long-term reliability and availability of the system. Regular inspections can identify any performance or reliability issues early on to minimize downtime and costly repairs. If something does not look right on site, make sure to discuss it with the O&M team.

 **Environmental impact and sustainability.** Beyond supporting local agricultural production, agrivoltaics can also help improve ecosystem functions and provide other environmental benefits. Incorporating livestock and/or regenerative farming techniques can improve soil health and longevity of the farmland. Establishing pollinator habitat can lead to biodiversity conservation and increased pollinator populations for local pollinator-dependent crops. Agrivoltaic farming can also lead to significant water savings in certain climates. To examine these potential benefits, researchers and farmers have collected data on soil micro- and macro-nutrients, pollinator richness and diversity, and water use and soil moisture.

 **Community engagement and education.** Continuous engagement throughout the project lifecycle is necessary to monitor progress, resolve any issues that arise, and adapt to changing circumstances. This ongoing collaboration helps increase the long-term success and overall impact of the project. It is generally easier to integrate things earlier in the development process than later.

Continuous improvement. Good agricultural producers are continuously learning and adapting to changing conditions to improve yield; agrivoltaics operators should also strive for continuous improvement. Agrivoltaic outcomes and best practices can differ from open-air agriculture and need to evolve throughout the project.



Green beans grow under an elevated solar array at Jack's Solar Garden in Longmont, Colorado. *Photo by Brittany Staie, NREL*

While these important steps help lead to successful agrivoltaics projects, every site is different and familiarizing yourself with the local solar development, agricultural, and policy landscapes can improve the chance of long-term success and meeting project-specific goals.

For supporting resources, visit:

- U.S. Department of Energy's **Farmer's Guide to Going Solar** (energy.gov/eere/solar/farmers-guide-going-solar)
- InSPIRE's **high-level financial calculator** (openei.org/wiki/InSPIRE/Financial_Calculator)
- **Database of State Incentives for Renewables & Efficiency** (dsireusa.org/) from the N.C. Clean Energy Technology Center
- Local solar policy guides for **Illinois** (agrisolarclearinghouse.org/the-illinois-agrivoltaics-regulatory-and-policy-guide-analyzes-state-and-local-laws) and **Colorado** (nrel.gov/docs/fy24osti/88556.pdf)
- The National Renewable Energy Laboratory's **permitting inspections and interconnection timelines resources** (nrel.gov/solar/market-research-analysis/permitting-inspection-interconnection-timelines.html)