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ILLINOIS POWER AGENCY

Agrivoltaics: How Can Solar Energy and Agriculture Work With Each Other?

April 28, 2023

Agenda

1. Housekeeping and Introductions
2. Agrivoltaics: Overview, Market Drivers, Barriers, and Opportunities (National)
3. Agrivoltaics in the Midwest
4. Agrivoltaics and Illinois Shines
5. Q&A

IPA Power Hour Webinars

- **Introduction and Scope**
- **Power Hour is a series of educational and informative presentations on a wide range of clean energy topics and emerging issues**
- **Today's Power Hour:**
  - During the webinar, the speakers will provide an overview on Agrivoltaics, market drivers and barriers, and state incentives nationwide. The speakers will also look at challenges and opportunities for Agrivoltaics in Illinois and discuss considerations for Agrivoltaics incentives for community solar projects.
- **Future IPA Power Hour Webinars will cover other topics related to the clean energy economy in Illinois**

IPA Power Hour Webinars

Upcoming Webinars

IPA Power Hour 4-From Brownfield to Brightfield: The Impact of Brownfield Redevelopment on Communities

Date: May 26, 2023

Time: 12-1pm CST

REGISTER HERE

The Impacts of Wind and Solar Projects to the Local Economy

Date: June 30, 2023

Time: 12-1pm CST

REGISTER HERE

The Illinois Power Agency

- **Independent State Agency created in 2007**
- **Agency duties include**
  - **Development and implementation of procurement plans for electricity supply for utility customers**
  - **Development and implementation of solar incentive programs**
  - **Implementation of the Renewable Portfolio Standard**
    - Development of Long-Term Renewable Resources Procurement Plan
    - Conduct competitive procurements for utility-scale projects
    - Manage programs for community solar and solar for homes and businesses

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Agrivoltaics: Overview, Market Drivers, and Barriers

Joel Tatum
Midwest Solar Specialist
American Farmland Trust

FARMS UNDER THREAT

American Farmland Trust

SAVING THE LAND THAT SUSTAINS US

PROTECT FARMLAND
We lose 2,000 acres of farmland a day across the US: this has serious implications for food production, our environment, and the next generation of farmers. Climate change and extreme weather are compounding risks to farmland and soil health.

PROMOTE SOUND FARMING PRACTICES
We help farmers with the difficult transition to more regenerative farming practices that rebuild soil health, sequester carbon, protect our waterways, and boost income.

KEEP FARMERS ON THE LAND
A large transfer of farmland is looming. More than 40% of American farmland is owned by farmers aged 65 and older. AFT provides guidance, tools, and partnerships that connect current landowners with diverse, new farmers to ensure a sustainable farming future.

American Farmland Trust

Agrivoltaics

- or co-location of solar, is the practice of installing solar photovoltaic panels on farmland in a way that primary agricultural activities (such as animal grazing and crop/vegetable production) can continue.

- The design, management practices, and suitable agricultural activities that fare well in Agrivoltaic situations have improved over the years. New research demonstrates that states and regions can more than meet their ambitious solar energy goals on marginal and developed land without sacrificing its productive farmland and sensitive wildlife habitat.

Applications Of Agrivoltaics

- **Distributed Generation** – Farmer or land owner owned solar. In these applications small scale Agrivoltaics can have the benefit of research for viable crops and produce small crops for on fam use. Distributed Generation applications are typically smaller applications.
- **Community solar** – Community Solar applications are typically midsized applications where small horticulture crops can thrive. Vegetable and leafy crops can be utilized for sale locally or in the open market.
- **Utility-scale solar -** Large parcels with many acre applications. Research is being done on these parcels to incorporate a true commodity crop into production. Examples of this are wheat, bean and hay crops that can be conventionally farmed.

Photos: Silicon Ranch, AFT, Jacks Solar Garden

Concepts in Agrivoltaics – what we know, Misconceptions

- Crops won't grow under solar panels
- Agrivoltaic practices add cost to project development.
- Farming under solar panels can only happen in a manual harvest situation
- Depending on the way that projects are designed, installed and mitigated, Agivoltiacs cause erosion and soil damage.
- Land with Agrivoltaic arrays designs and practices don't add value to landowner or community.

Keys to Establish Best Practices

- Establish Agricultural Compatibility
- Develop ready-to-go designs
- Determine best construction and installation methods Implement regenerative practices
- Improve animal welfare and health
- Increase site biodiversity
- Support wildlife habitat, mobility, and migration

Legislation and Policy to advance Agrivoltaics

- Agrivoltaic incentive points are available in IL for community solar through the Illinois Shines (Adjustable Block Program)
- USDA through Farm Bill 2023 working on Agrivoltaic definitions
- Possible incentives tied to the REAP grant for famers and large scale loans
- More development and deployment of small and large scale solar through the IRA over the next few years
- Potential for first farmer groups and underserved communities in creating farming opportunities through Agrivoltaics.

AFT's Smart Solar Principles

Principle 1: Prioritize Solar Siting on Buildings and Land Not Well Suited for Farming

Emphasize solar energy development on rooftops, carports, irrigation ditches, brownfields or other land not well suited for agriculture to help minimize the impacts of solar energy on our nation's best agricultural land and farm businesses.

Principle 2: Safeguard the Ability for Land to Be Used for Agriculture

If solar energy is developed on farmland or ranchland, policies and practices should protect soil health, especially during construction and decommissioning, to ensure opportunities for farming in the future.

Principle 3: Grow Agrivoltaics for Agricultural Production & Solar Energy

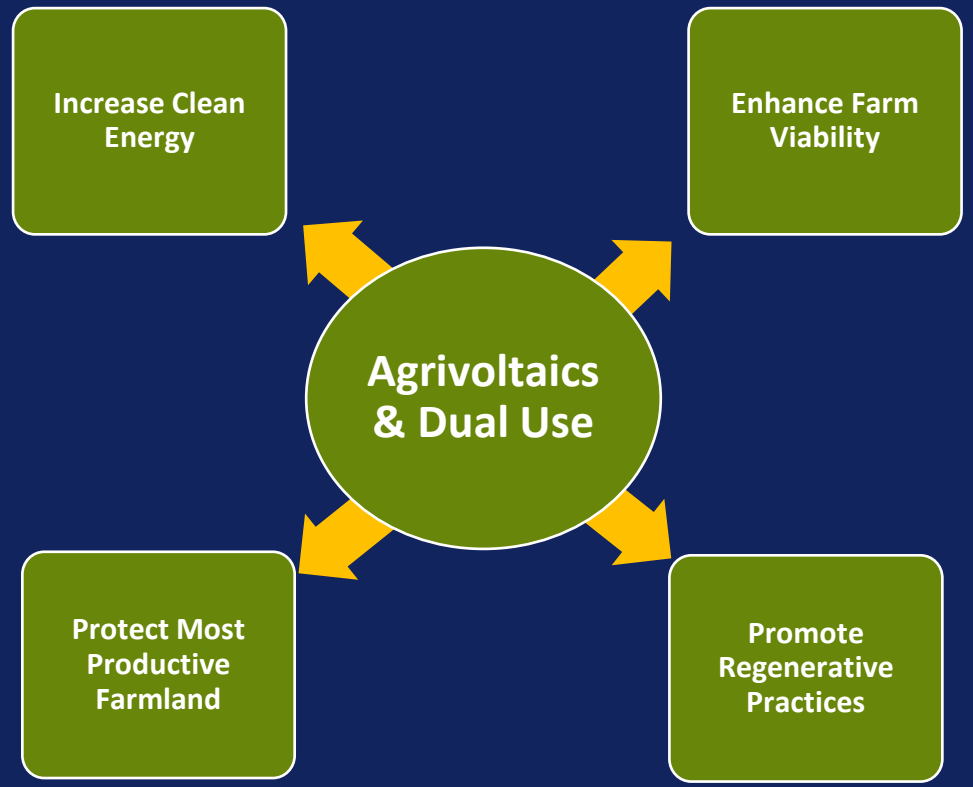
Agriculture and solar energy can coexist if appropriate planning is undertaken. Agrivoltaic projects sustain agricultural production underneath solar panels and/or between rows of solar panels throughout the life of the project.

Principle 4: Promote Equity and Farm Viability

Farmers and underserved communities should benefit from solar energy development. There must be inclusive stakeholder engagement to ensure projects strengthen farm viability and reflect farmer interests, including underserved producers that face barriers to accessing land and other resources.

Potential of Agrivoltaics

Agriculture + Solar, Optimized to Work Together



American Farmland Trust

Thank You!

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Agrivoltaics in the Midwest

SCAPES

Sustainably Co-locating Agricultural and Photovoltaic Electricity Systems

iSEE Institute for Sustainability, Energy, and Environment

USDA National Institute of Food and Agriculture

Transforming Food and Solar Energy Production Using Agrivoltaics

Dr. Kaiyu Guan

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About the SCAPES Project

What SCAPES is

- Sustainably Co-locating Agricultural and Photovoltaics Electricity Systems

Who we are

- Led by the University of Illinois at Urbana-Champaign
- An interdisciplinary team of agriculture, economics, geography, biology, psychology, and engineering researchers
- Aim to boost renewable energy and the resiliency of food production

Research Goals

- **Experiment**: Coordinate the design of a suite of experimental agrivoltaic arrays and measurement systems across regions
- **Assessment**: Determine crop and photovoltaic performance within an integrated agrivoltaic system
- **Integrated modeling**: Incorporate regional results into an integrated model that is capable of conducting structural, electrical, thermal, agricultural, water management, and economic outcomes
- **Solutions**: Integrate stakeholder perceptions of agrivoltaic system design and share model outputs through open-source tools for informing planning and development

Research Components

Leader & different Institutions

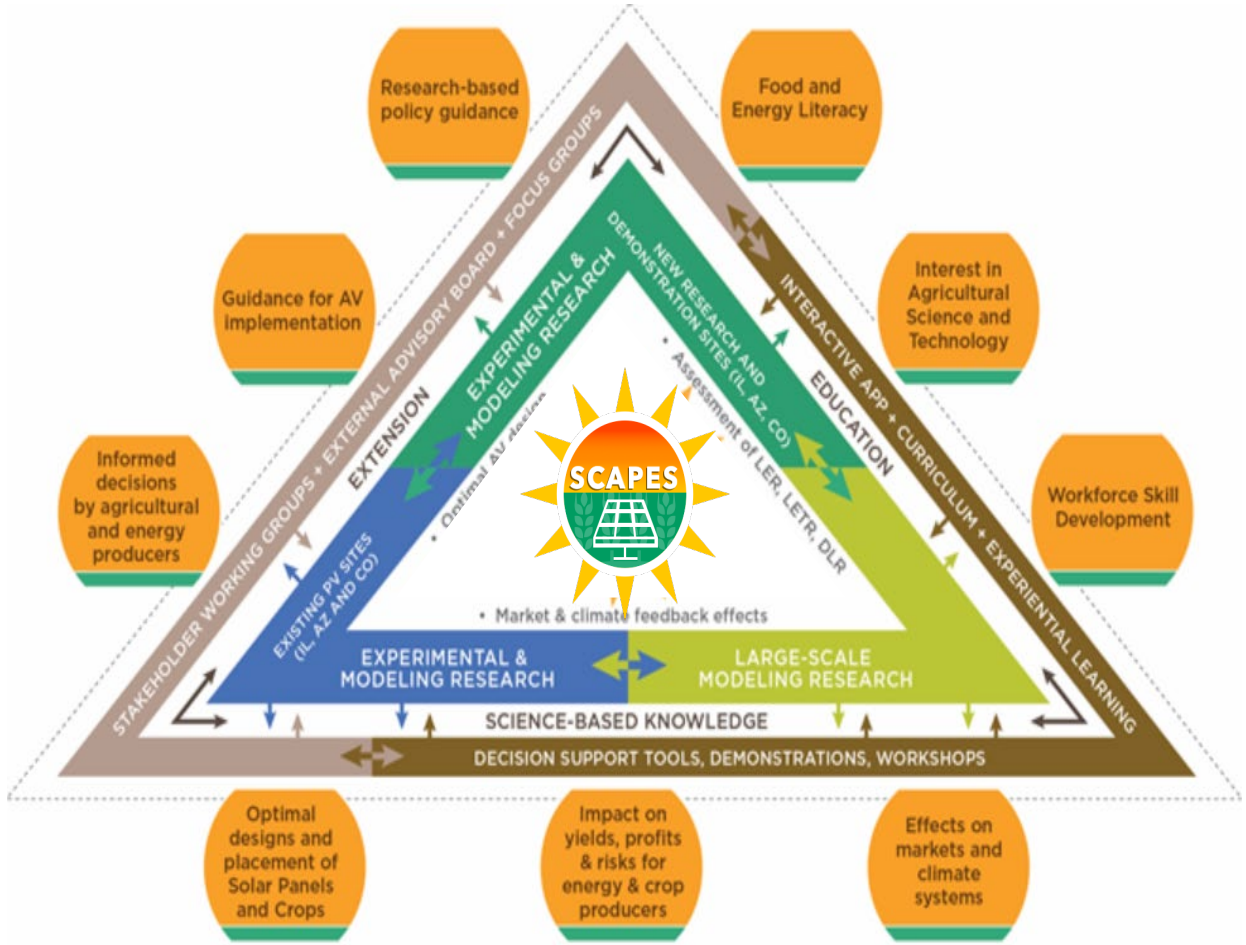
- Prof. Madhu Khanna (PI)
- UIUC, UArizona, CSU

Agrivoltaics research divided into three components:

- Crop physiology
- Solar panels optimization
- Modeling

Extension and education:

- Stakeholder working groups
- Educational app



Agrivoltaics types

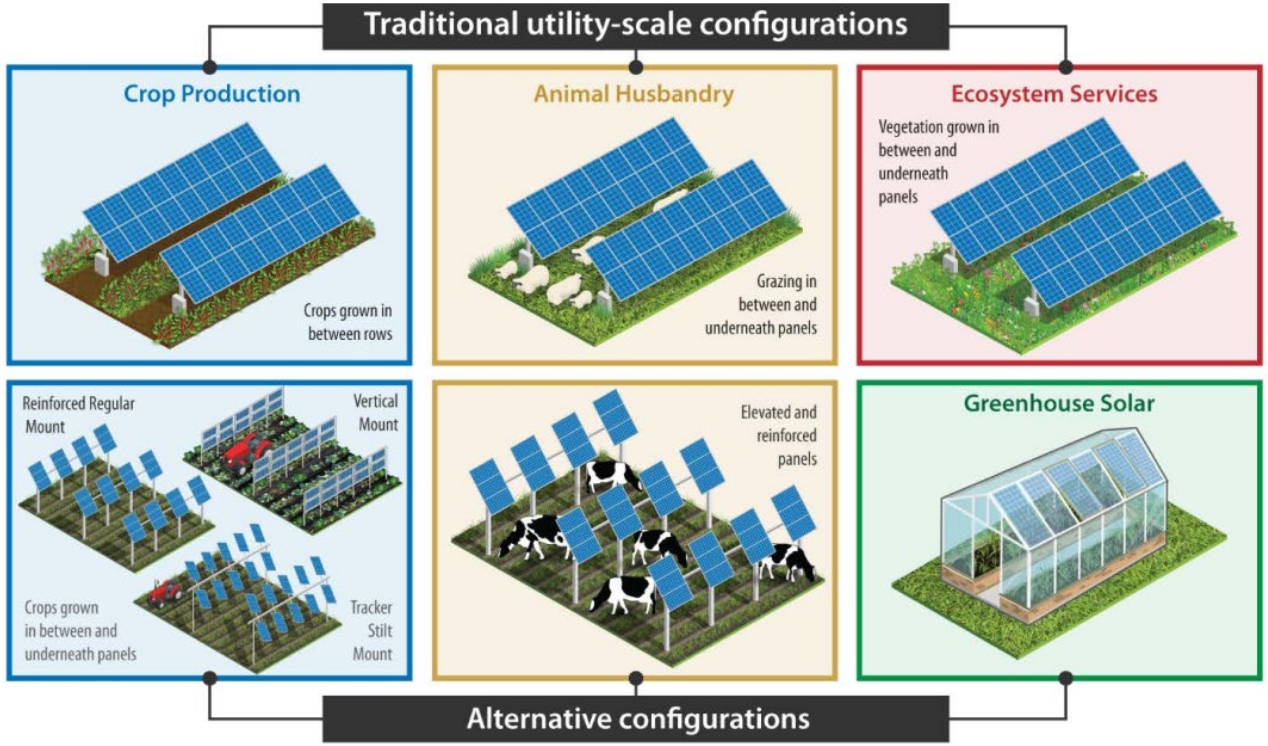


Figure 1. Types of agrivoltaics systems that have been deployed commercially.

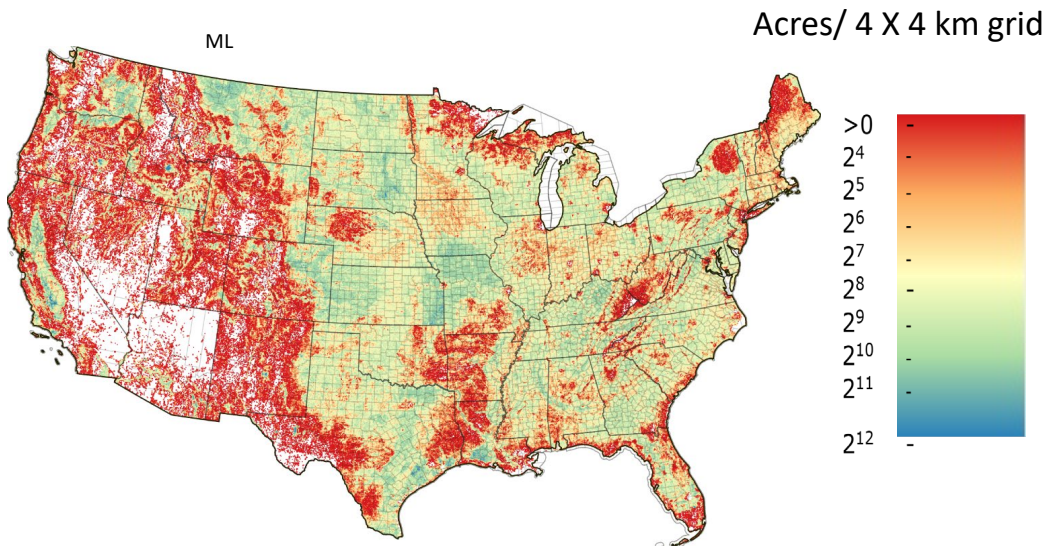
Source: NREL (2022)

- Agrivoltaic systems is categorized into two types depending on how the systems are planned:
  - Land use under pre-existing fixed PV panels
  - Land use under PV panels planned for agrivoltaic system installation

What are key drivers of economics of Agrivoltaics in the Midwest?

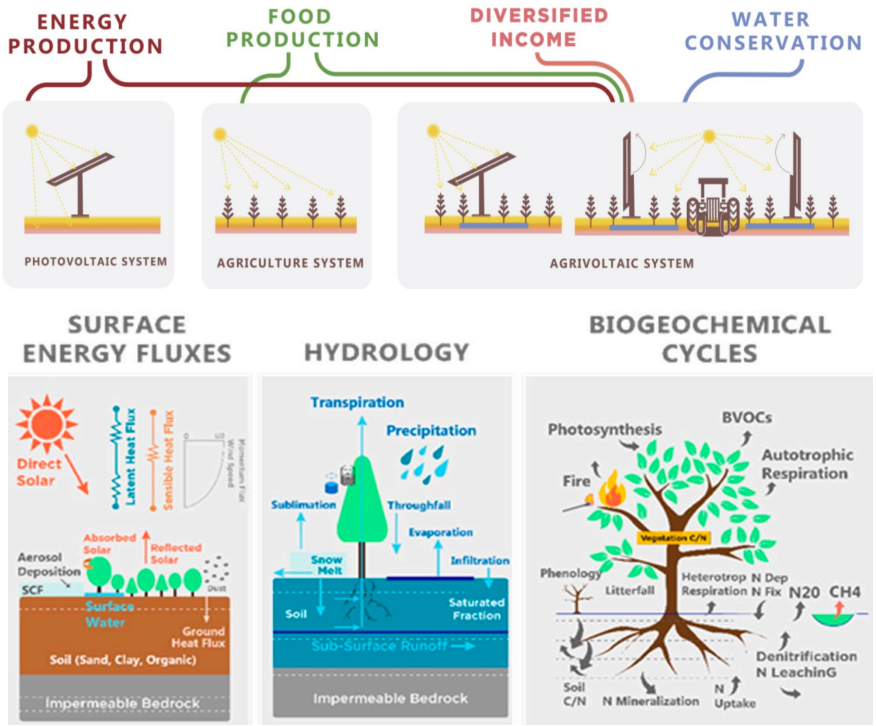
- Agricultural factors
  - Higher prices and yields, crop choice to ensure crop profitability
  - Land availability and consideration of marginal land

- Solar energy factors
  - High upfront capital costs (e.g., cost of panels, new equipment).
  - Operational costs (e.g., vegetation, labor)
  - Area allocated under panels affect amount of solar electricity production
  - Price of electricity increases solar revenue
  - Community opposition to solar could increase delay costs



Non crop marginal land in the US
Source: Unpublished, SCAPES Econ Working Group

Modeling of Agrivoltaics



- The modeling work lead by my group:
- Dr. Mengqi Jia & Dr. Bin Peng

- Develop a process-based ecosystem model for quantifying feedback effects of agrivoltaics on energy, water, food and climate at local and regional scales.

- The simulation results will facilitate the understanding and adoption of sustainable Agrivoltaics systems.

Challenges, Barriers and Future

- Potential competition of solar for land with agriculture
- Challenges with managing crop stress under extremes – heat and precipitation- with a changing climate
- Need for climate smart agricultural practices while keeping the cost of solar energy low
- Agrivoltaics has the potential to enable the use of land for crop production and solar energy generation
- Our proposed research–education–extension agenda will lay the foundation for continuing to advance the field of Agrivoltaics with applications relevant to the full range of agroecosystems found in the US. Specific outcomes are detailed in the Logic Model.

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Agrivoltaics and Illinois Shines

Illinois Shines

- **Small Distributed Generation (DG) (20%)**
- Up to 25kW
- **Large Distributed Generation (DG) (20%)**
- 25kW – 5MW
- **Traditional Community Solar (30%)**
- Up to 5MW
- **Community-Driven Community Solar (5%)**
- Up to 5MW
- **Public Schools (15%)***
- Located at public schools (including school district land)
- **Equity Eligible Contractors (10%)**

Community Solar

- **Traditional Community Solar vs. Community-Driven Community Solar**
- Traditional Community Solar projects are large-scale, transactional projects sited in areas with ample land
- Community-Driven Community Solar category aims to drive development of new Community Solar projects sited in the communities they are built in
- Different levels of incentives
- Under CEJA, 50% minimum small subscriber requirement for all Community Solar projects

Community-Driven Community Solar

- **New category under CEJA**
- **Criteria for selecting projects**
  - Including direct and indirect community benefits, beyond project participation such as economic, environmental, social, cultural, and physical benefits
  - Specifies “not greenfield project” as a criterion
    - previously undeveloped land or agricultural land and that does not meet the definition of a brownfield site
  - Other criteria include:
    - Development density of location
    - Commitment to serve local subscribers
    - Engagement in project operations and management by nonprofit organizations, public entities, or community members.

TCS Project Selection

- **Section 1-75(c)(1)(K)(iii)(1) specifies that "the Agency shall select projects on a first-come, first-serve basis, however the Agency may suggest additional methods to prioritize projects that are submitted at the same time."**
  - Projects submitted on the first day are considered submitted "at the same time"
  - IPA scores projects only if more project applications are received on that "first" day than the Agency has capacity available
  - Scoring system based on factors outlined in statute for Community-Driven Community Solar
  - Scoring categories include siting (in EJ community, e.g.), Equity Eligible Contractor, interconnection status

TCS Project Selection

- **Built Environment category:**
  - **Sited on "disturbed land" as defined by United States Geological Survey, "contaminated lands" as defined by the US EPA, or rooftops or other structures (2 points)**
  - **Sited on a brownfield (2 points)**
  - **Commitment to utilize agrivoltaics (1 point)**
  - **Commitment to pollinator friendly habitat, as defined in in the Pollinator Friendly Solar Site Act (525 ILCS 55) (1 point)**
  - **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)

Agrivoltaics & Pollinator Friendly

- **Program Administrator will monitor projects that commit to agrivoltaics or pollinator-friendly vegetation for duration of 20-year REC contract**
- **Definition of "agrivoltaics" in Illinois Shines:**
  - "[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."
  - Includes livestock grazing
  - Requires a plan that maintains or enhances agricultural productivity, balances electric generation and crop production, uses compatible crops

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Q&A

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