What Will Drive Agrivoltaics Adoption: Evidence from the U.S. Solar Developer's Survey

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Introduction

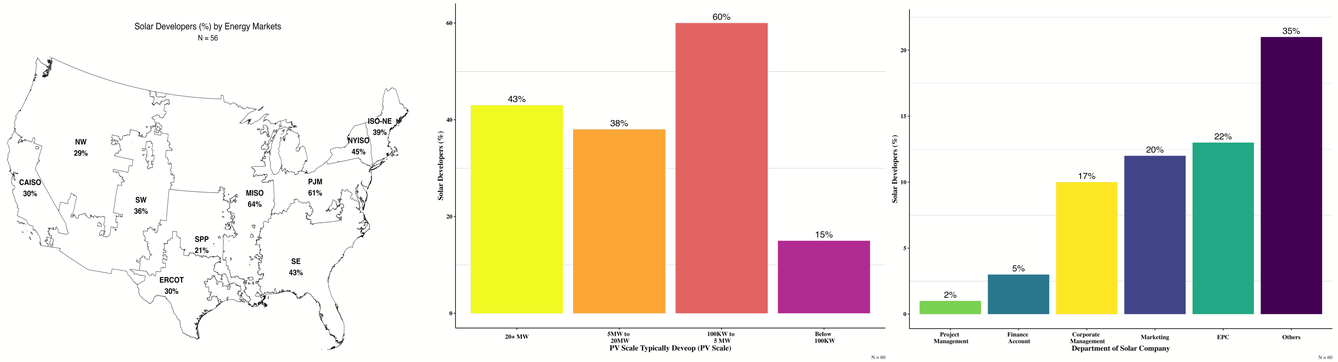
The rapid expansion of solar energy on U.S. farmland faces land-use conflicts and community opposition. Agrivoltaics is proposed as a middle-ground solution. Which factors will influence a solar developer's decision to adopt agrivoltaics remain under-explored. We examined factors that will influence a developer's decision to adopt agrivoltaics as well as the current status and future interests in agrivoltaics development in the U.S. Our findings show that reducing community opposition to large scale solar energy projects is the strongest driver of agrivoltaics adoption. At the same time, developers face challenges such as coordination difficulties, a lack of regulatory assurances, and perceived risks associated with novel dual-use technology. Despite such challenges, we found that solar developers are building several agrivoltaics projects across the country and are interested in developing more in the future. Addressing barriers related to limited policy incentives, regulatory uncertainty, coordination challenges, and perceived risks will be critical to accelerating agrivoltaics development in the US.

Solar developer's motivations and barriers for agrivoltaics adoption identified through focus group discussions from 2022 to 2024

	Positive Factors	Negative Factors
Internal Factors	**Strengths (S)**	**Weaknesses (W)**
	S1: Strong commercial drive for agrivoltaics. **S2:** Dual revenue stream for soar and agriculture. **S3:** Community support and acceptance of solar with agrivoltaics. **S4:** Appealing aesthetics of agrivoltaics compared to solar alone.	**W1:** Agrivoltaics require more land than solar alone. **W2:** Limited adoption of agrivoltaics by other developers. **W3:** Difficulty of coordinating operations with farmers/landowners. **W4:** Higher risks and liability during project development, operation, and management.
External Factors	**Opportunities (O)**	**Threats (T)**
	O1: Expanding solar into rural farmlands. **O2:** Reducing vegetation management and operational costs. **O3:** Reducing community opposition to solar. **O4:** Gaining reputation as an agrivoltaics leader.	**T1:** Lack of investment funds for agrivoltaics (e.g., loans, microfinance, etc.) **T2:** Commercial risks associated with novel technology. **T3:** Lack of regulatory assurances to support agrivoltaics. **T4:** Lack of policy incentives for agrivoltaics (e.g., tax credits)

Notes: Strengths, Weaknesses, Opportunities, and Threats were synthesized following focus group discussions with solar developers and farmers from 2022 to 2024. These factors are motivation and barriers of agrivoltaics adoption among solar developers.

Results: Solar developer's regional distribution and demographics



Regional distribution of survey participant's solar company operating over the last five years* (left). Typical size of photovoltaic solar energy projects survey participants solar company develops in the U.S.* (middle). Departmental affiliation of solar developers within their solar company (right). * Select all that apply.

Results: Current status of and future interests in agrivoltaics project development in the U.S.

Agricultural Enterprises	Currently Developing*	In the Next Five Years
Row Crops	25%	21%
Specialty Crops	30%	25%
Pollinator Habitat	49%	16%
Livestock	59%	29%
Others	14%	6%
Total Sample	63	63

Currently developing and future interests in agrivoltaics projects by agricultural enterprises. *Select all that apply. None excluded.

Solar Energy Scale	Currently Developing*	In the Next Five Years
Large Utility Scale (20+MW)	40%	37%
Small Utility Scale (5MW-20MW)	33%	26%
Medium Scale (100KW-5MW)	52%	34%
Small Scale (Below 100KW)	14%	2%
None	-	2%
Total Sample	63	62

Current development and future interests in agrivoltaics projects by solar energy scales. *Select all that apply.

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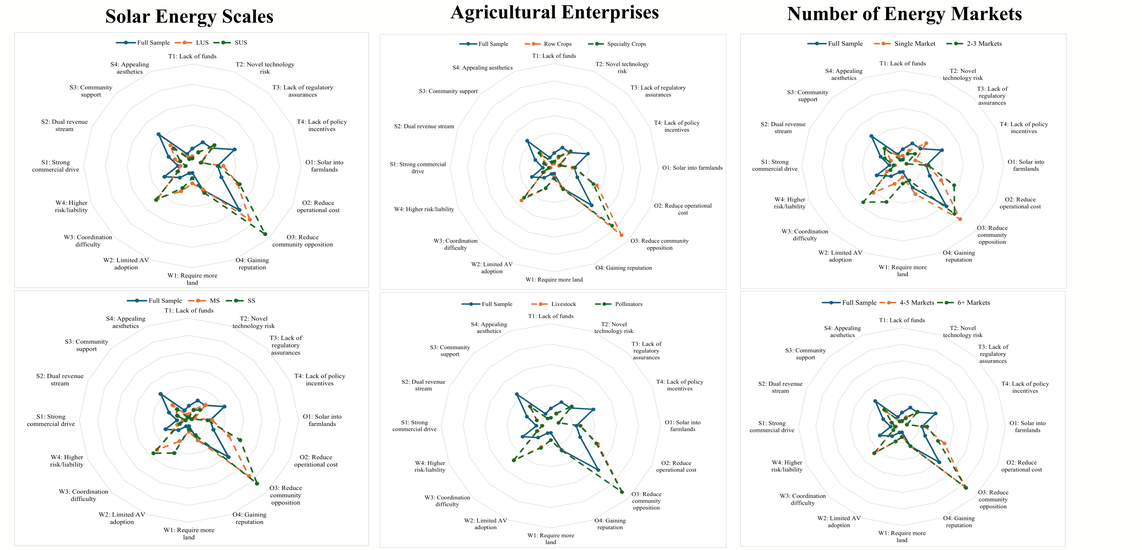
Results: Relative importance of strengths, weaknesses, opportunities, and threats of agrivoltaics



Priority weight based relative ranking of SWOT factors and their relative importance for AV adoption among solar developers by solar energy scale, agricultural enterprises, and the number of energy markets operated by developers. Full Sample = all data collected for the study; LUS, SUS, MS, and SS are Large Utility Scale (20+MW), Small Utility Scale (5MW-20MW), Medium Scale (100KW-5MW), and Small Scale (Below 100KW) AVs, respectively. Agricultural enterprises represent agrivoltaics with respective agricultural enterprises.

Conclusion and Key Takeaways

Solar developers are motivated by opportunities associated with agrivoltaics development, particularly the potential to reduce community opposition to large scale solar projects and, in some cases, reduce operational costs. However, external factors beyond developer's control—such as coordination difficulties with farmers and landowners, lack of policy incentives, and the absence of clear regulatory frameworks—remain major challenges limiting agrivoltaics adoption. Despite these constraints, medium scale to large utility scale agrivoltaics projects are currently under development in the US, with several projects integrating solar energy with livestock grazing and pollinator habitat. Solar developers further express strong interest in pursuing utility scale agrivoltaics projects within the next five years.