SOLAR GRAZING SURVEY

A survey was sent to three entities

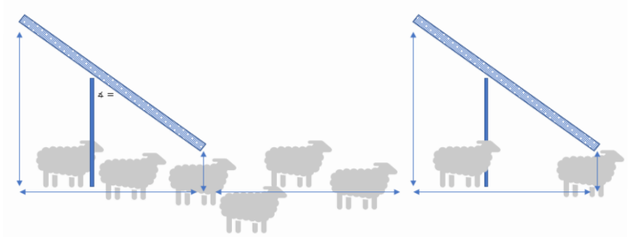
1) Sheep farmers grazing solar sites
2) Landscapers maintaining solar sites
3) Solar site managers

The survey collected data to assess economics of solar sites across NYS and the eastern US and to gain a better understanding of co-located, agrivoltaic systems and the emerging solar grazing industry. The survey results were used to underpin agricultural and economic analyses of solar grazing for sheep farmers.

Musgrave Research Solar Farm 2018. Rotationally grazed with sheep. At no point did vegetation shade the panels.

CONCLUSIONS

Grazing sheep on solar sites is a cost-effective measure to control on-site vegetation and prevent panel shading.



It is less labor-intensive than traditional landscaping services and, thus, less expensive. Yet, sheep grazing was just as effective as traditional landscaping management.

More thorough research is needed to investigate the environmental impact of traditional landscaping vs grazing to control vegetation on solar sites. Measurements should include a broad variety of soil parameters: run-off, herbicide use, the suitability for co-location with pollinators by the enhancement of pollinator plant species, and control of invasive species.

Recommendations should be provided to solar site developers to include amenities like on-site wells and power outlets as well as high quality predator-proof fencing to reduce investment costs for sheep farmers. Multi-year contracts should be used to encourage more sheep farmers to become interested in grazing solar sites, to ensure that agricultural land will remain in production.

New marketing strategies should emerge for solar-raised and grass-fed lamb that can also be a direct benefit for small-scale sheep farmers from co-locating sheep grazing with renewable energy.

DAVID R. ATKINSON CENTER
for a Sustainable Future

The agricultural, economic, and environmental potential of co-locating utility scale solar with grazing sheep.

2 Part Preliminary Investigation:
Field Trial & Solar Grazing Survey

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FIELD TRIAL

Data were collected from the Cornell University Musgrave Research Farm solar site located in Aurora, NY. Sheep were grazed between May and November 2018 to obtain agronomic and economic data, as well as to gather knowledge of the feasibility of grazing sheep on solar sites. Literature values were used to estimate the environmental impact of grazing. Data for traditional management (labor and equipment running hours) were obtained from a landscaping contractor for a comparable Cornell University solar site at Harford, NY.

All ewes were dry (non-lactating) when they were moved on site in May and breeding rams were introduced in September 2018 for January 2019 lambing. No health incidents were observed. Additional checks for internal parasites were conducted throughout the grazing season and did not lead to concerns about internal parasites. No predator issues were recorded; the chain link fence proved to be enough protection; no guard animals were necessary. The sheep had access to water and sheep mineral ad libitum.

Per income and expense of solar grazing in New York and across the eastern United States

New York State

	Directly contracted	Subcontracted
Income	$555	$320
Expenses	$46	$46
Net	$509	$274

Eastern United States

	Directly contracted	Subcontracted
Income	$326	$308
Expenses	$64	$64
Net	$262	$244

In a survey of sheep farmers grazing solar sites, 14 total sheep farms responded, with 4 being in New York State. A total of 3,503 acres of utility solar are being grazed in the eastern US, 79 acres in NYS. All grazed sites were established between 2012 and 2018. The grazing season varies between the eastern US average (March to December) and NYS (April/May to November) due to more extended grazing periods farther south in the US. Stocking rates were lower in the US average east of the Mississippi (3 sheep per acre) compared with NYS (4 sheep per acre). A variety of sheep are used for solar grazing; hair sheep such as the Katahdin and Dorper breeds are most prevalent.

On average, sheep farmers drive 42 miles (US) and 27 miles (NYS) from their home farm to the solar site that is grazed with sheep. The grazing contracts are mostly between the solar site Operations and Management contractors and the sheep farmer directly. Less often, but also prevalent, the contracts are bid upon and obtained by landscaping contractors and then subcontracted to a sheep farmer. This system has the advantage of no additional insurance to carry for the farmer, as well as the security of a landscaping company being available to remove invasive plant species. These contracts are renewed through a bidding process. With a few multi-year exceptions, sheep farmers obtained yearly contracts.

Site Vegetation Management

Excerpt of Field Trial Results:
Summer 2018 at Cornell-Owned Solar Sites

The data available from a site vegetation management contract in Harford, a 10 acre solar site, were used to establish cost and income structure per acre for traditional site maintenance. Harford requires 16 hours of mowing as well as 140 hours of string trimming per year. That amounts to a total labor requirement of 156 hours per year for a 10-acre site. Extrapolating to the 22-acre Musgrave site, traditional vegetation management requires 36 hours (18 hours twice a year) of mowing and 308 hours of string trimming per year, amounting to 344 total labor hours, excluding travel. Our data found that utilizing sheep for site vegetation management requires a total of 139 hours including travel time or about 2.5 times less. From the survey, the O&M managers budgeted $868 per acre.