Agriculture and Solar Energy Dual Land Use

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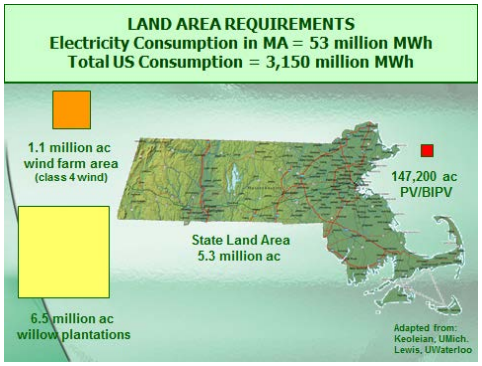
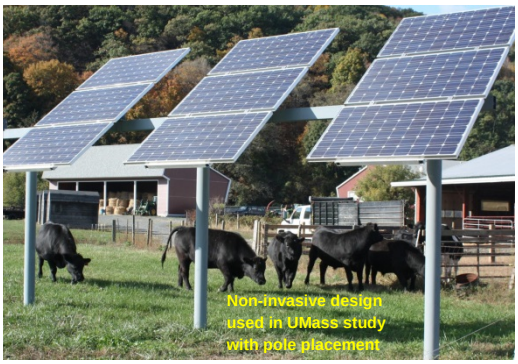
Rationale: This Research Project is grounded in the understanding that there is a need for sustainable renewable energy sources for Massachusetts and the U.S. and we suggest solar power as an area of great promise. The map below compares how much land would be required to power Massachusetts with three forms of renewable energy. Only solar has the potential to substantially power the state while only using a reasonable amount of the state's land mass. Traditional ground mounted solar installations on farmland, however, remove arable land from potential agricultural use.



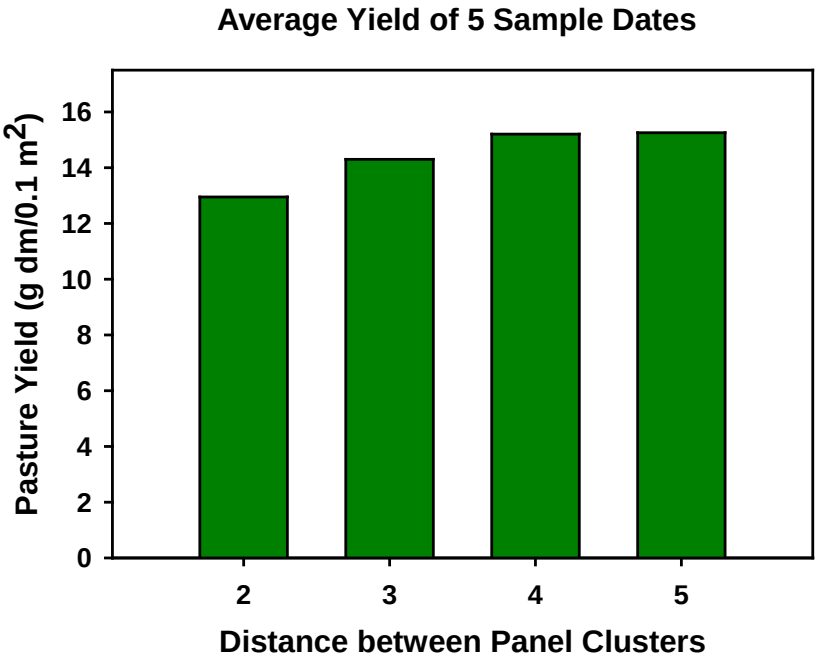


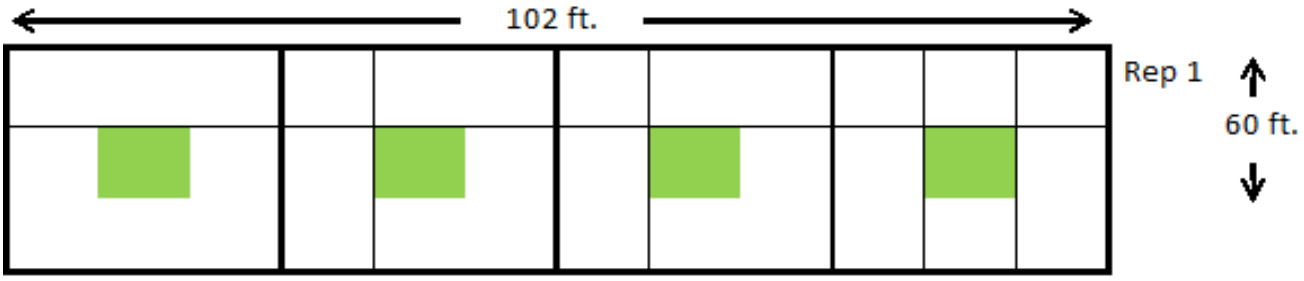
Research Goals: This project is exploring raised solar panels that enable use of the field under the solar panels as pasture as shown in the right figure above. The goal is to provide farmers and installers of solar PV options for installing solar arrays on farm fields without taking the field out of production.

Treatments: In the project's first phase, installation techniques were developed as 106 panels were installed in livestock pasture areas. New techniques were developed to install (drive) poles with no disturbance to the soil or crop underneath. At the same time, methods were developed to create stable structures without the use of large concrete bases which would have also created excess disturbance to the soil. Panels were installed about 7.5ft (2.3m) off the ground with spaces between panel clusters varying from 2 to 5ft. An experimental test site for dual use of land for photovoltaic and agricultural production has been proposed to demonstrate the feasibility of growing field crops under solar panels. The site would be available for applied field studies for vegetable and field crops.

Results: The research examined effects of panel spacing and panel placement while continuing
agricultural use of the underlying ground. Initial results suggest a space of 3.5 to 4.0ft (1 to 1.2m) is needed between panel clusters to maintain 90 to 95% of the pasture yield without shade from solar panels.

The proposed experimental test site is as follows (as well as in the schematic below): 3 rows x 4 panel cluster spacing x 3 clusters/spacing x 4 replications (4 panels/cluster)
Total clusters = 144
Total panels = 576
Approx. 144 KW
Proposed panel cluster spacing treatments are 1.5ft, 2.5ft, 3.5ft, and 4.5ft. (45cm, 75cm, 105cm, and 135cm) plus control areas without panels.





Green-shaded areas represent plot areas (panel cluster plus spacing between adjacent bordered by the same spacing between panel clusters (one rep of 4 planned). Minimum height of the lowest part of panels above the soil surface would be 10ft (3m) to allow movement of tractors and farm equipment. It is hypothesized that different vegetable crops may have varying spacing requirements although a somewhat optimum spacing might be similar and achievable for many vegetable crops. A preliminary evaluation of vegetable crops is currently underway in the existing installation.

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