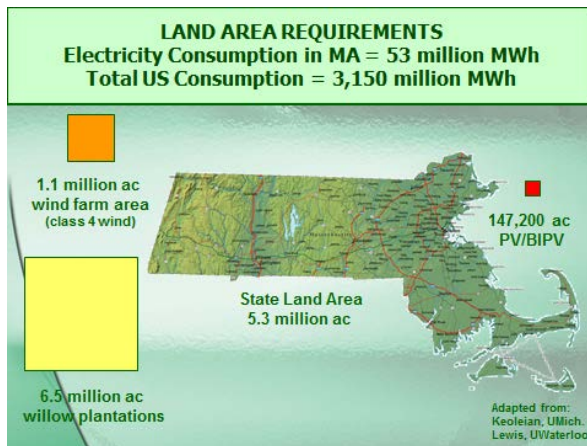


## Agriculture and Solar Energy Dual Use Research Project, University of Massachusetts, Amherst

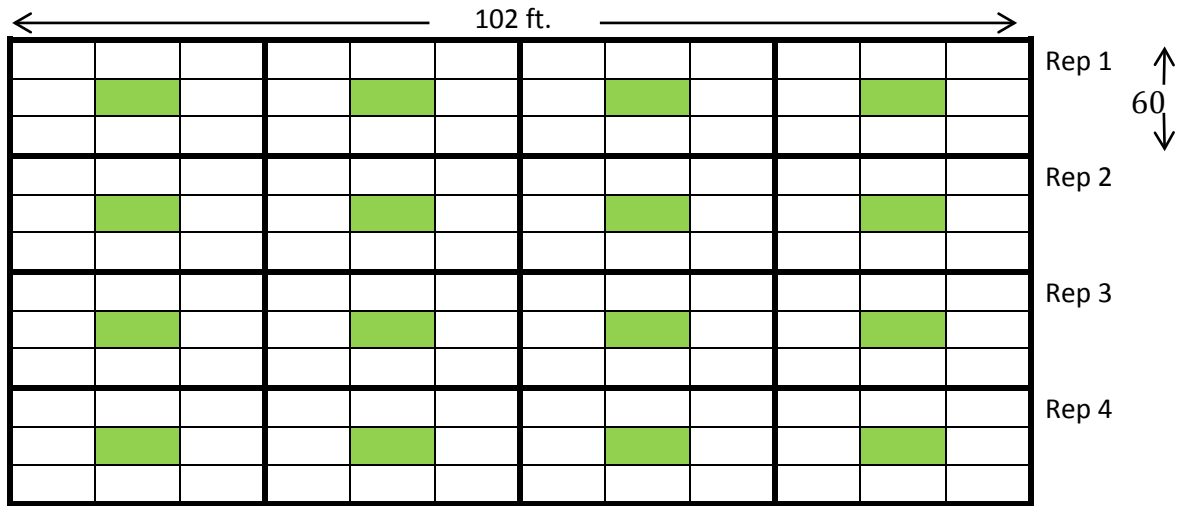
This Research Project is grounded in the understanding that there is a need for sustainable renewable energy sources for Massachusetts and the U.S. and we suggests solar power as an area of great promise. The map below compares how much land would be required to power Massachusetts with three forms of 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. This project is exploring raised solar panels that enable use of the ground underneath as pasture or for crops as shown in the right figure below.



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. The research also 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.

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. The proposed experimental test site is as follows below:

3 rows x 4 panel cluster spacings 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 area represents a plot area (panel cluster plus spacing between adjacent bordered by the same spacing between panel clusters. 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.