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Solar Farming in Maine: An Objective Overview

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Solar Farming in Maine: An Objective Overview

Introduction

The US Energy Information Administration predicts that there will be 28% more energy use globally by the year 2040 (1). Coupled with this, is an increase in awareness of the negative effects of greenhouse gas emissions on the environment. These two facts are among the main drivers behind the heightened interest and investment in renewable energy sources. Solar energy, with carbon emissions estimated as 43 times less than natural gas (2), is a particularly attractive source of renewable energy.

Maine has the distinction of being both one of the highest per capita consumers of fossil fuels in the nation (3), as well as having the least solar power of all the 6 New England states (4). While these facts may make Maine a good candidate for increased development photovoltaic (PV) solar array farms, there are drawbacks to this source of renewable energy as well. Placing solar arrays directly on agricultural land has the potential to both increase farm income and reduce farm productivity. It is imperative that Maine researches the potential risks and benefits to solar farming on agricultural land in order to decide what type of policy is best suited for the state.

Why Not?

California is on track to generate 50% of the energy it needs from renewable energy sources by 2020, in part through power generated by PV solar farms (6). In fact, California produced so much electricity in 2017 that there were times when it needed to pay neighboring states to take the extra power (7). While these facts are excellent improvements in terms of CO₂ emissions, solar farms have their own environmental impacts.

Farmland loss

A solar farm placed on arable land will likely take that land out of use for agriculture. The US already loses around 40 acres of farmland per hour (10), while global food demand continues to grow (9). This is of particular concern in Maine where there were 3.8 billion dollars in sales in 2014 from agricultural products alone (8). A reduction in farmed land could affect the food production of Maine as well as related agri-businesses (11).

Protected land

Solar farm site placement could also affect the ecology of nearby protected lands. In a study of solar farms in California published in 2015, Hernandez et al. found that the majority of solar farms were less than 10 km from protected lands. Proximity to protected lands can “obstruct corridor use, dispersion capabilities, [and] facilitate invasions of nonnative species through habitat loss, fragmentation, and isolation” (2). Maintenance of solar farms can also necessitate the use of artificial ground cover and herbicides to keep the surrounding weed, grass, and shrub growth low (11), potentially promoting polluted runoff and decreased carbon sequestration.

Infrastructure

Once solar energy is captured, it must be transferred to a transmission substation or local distribution substation via high voltage transmission lines (5). If a solar farm is far from a substation, the amount of money needed to build the necessary infrastructure and the potential to disturb sensitive habitat or farmland can be high (2).

Economic effects

While not as lucrative a cash crop as almonds, solar farming has the potential to be more lucrative than vegetable and fruit cultivation (13). If this holds true for solar farming in Maine, there is a potential for this to drive up costs of leasing land suitable for solar, making it less feasible for farmers to make a profit off of agriculture alone (11).

Potential benefits

Diversifying farm income

While dense, large scale solar farms can take farmland out of commission for their life span, it is absolutely possible for solar to be incorporated into a farm as an additional source of income (17). In the case of Greg Beldock's small farm in Vermont, his solar arrays are high enough that his sheep are able to graze beneath it (17). The solar arrays provide a more reliable source of energy and income for the farm and has a negligible impact on the land below it.

Mixing food and solar

As with The Beldock's farm in Vermont (17), it is possible for solar arrays and farmland to coexist. In fact, one study conducted by Marrou, H. et al in 2013 shows that shade tolerant lettuce is about as productive when planted in between PV rows as opposed to full sunlight (21). Yet another study by Pearce, J.M. and Dinesh, H. in 2016 shows that incorporating both solar panels and agriculture can increase a farm's economic value by 30 % (22).

Maine: What should we do?

Research and site selection

There is a growing body of research that uses GIS and multi criteria decision making in order to locate solar sites that maximize power generation, are close to existing grid infrastructure, and have the least impact on sensitive and protected ecological areas (2, 23, 24). These techniques should be employed in Maine in order to maximize efficiency and mitigate potential environmental harm.

Review current policies

As of this writing, Maine is in a legislative battle over net-metering (25). Net metering is a form of financial incentive where residential or small-scale solar producers can sell their energy back to the public utility company and get a decrease in their energy bill in return. The proposed legislation would reduce this benefit each year that a solar array exists, and could potentially result in solar being less affordable. When considering policy specifically for solar on agricultural lands, the current incentive structure for solar energy should be taken into account.

Gather stakeholders

Maine should create a commission to further study the issue of solar farming on agricultural lands. The commission should organize public meetings and discussions involving farmers, solar developers, researchers, environmentalists, locals, and economists. After gathering information and researching policy ideas, the commission should create focus groups for each stakeholder group. For example, inviting a mix of small, mid, and large scale farmers to discuss how potential legislation could impact them.

A survey should be created to gather information from farmers about whether or not they currently have solar, if it is on a building or on land, if on land, what percent of farmable land it covers, if they have looked into investing into solar energy, what barriers they may have experienced, and other basic knowledge questions.

Compile

The commission should compile research done with GIS site selection techniques, economic modeling, current policy review, and input from stakeholders to create policy recommendations for Maine.

Maine: What should we do?

This policy brief shows that it is possible to blend food production and solar farming. Farms can continue to be productive and generate a steady additional source of income through solar arrays. That being said, large-scale, dense solar farms on agricultural land have the potential to be environmentally harmful and weaken Maine's local and regional food systems.

There is no one size fits all solution for solar on farmland. Maine should consider a stepped permitting and zoning protocol similar to one recommended by the Massachusetts Executive Office of Energy and Environmental Affairs (26). This framework incentivizes solar installations on buildings, non-arable land, and then least arable land, in that order. A similar framework for Maine would also require site reviews for solar projects to investigate environmental impact for larger scale projects. These site reviews should include use of GIS multi criteria decision making. The permitting process for small scale solar that is designed to power the farm residence or farm equipment should be streamlined so as not to impede interest in residential-scale solar energy.

In conclusion, Maine should:

- Gather opinions from stakeholders
- Survey farmers to understand current solar usage on farmland as well as interest and concerns
- Do economic, environmental, and site selection research that is specific to Maine
- Implement varying permit requirements for solar installations on farmland that incentivizes solar on non or less arable land

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