Food and Energy Farms Simulation Tool

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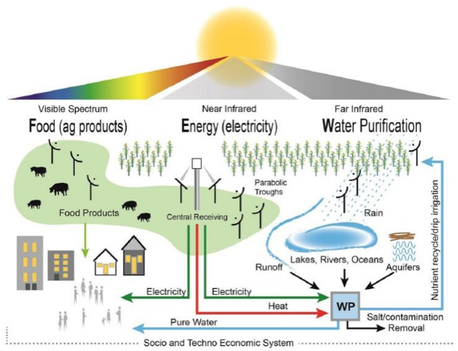
Motivation

- Rapidly growing food, energy, and water demands are projected in an impending 'full earth' scenario.
- Novel, sustainable solutions are needed to meet our systematic needs.
- Recent work indicates that solar energy can be divided to help supply all these needs locally.



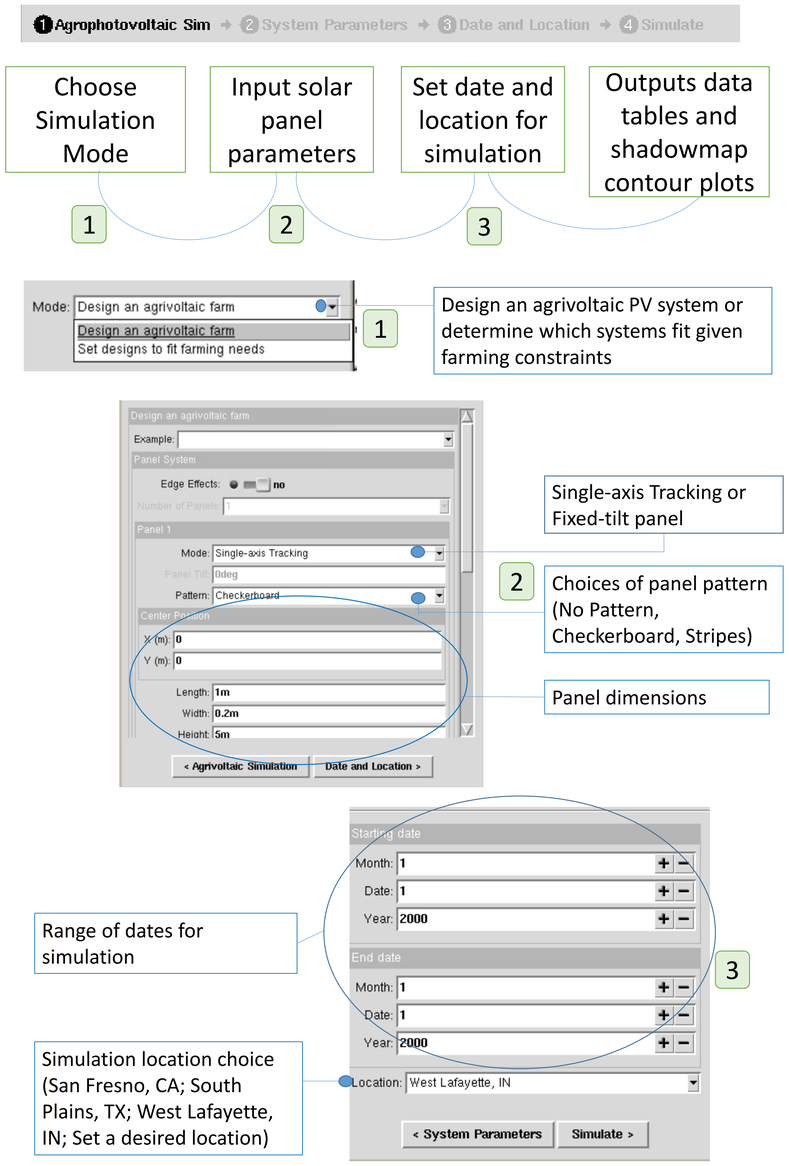
Adapted from Gencer et al., Scientific Reports (2017).

Project Background and Goal

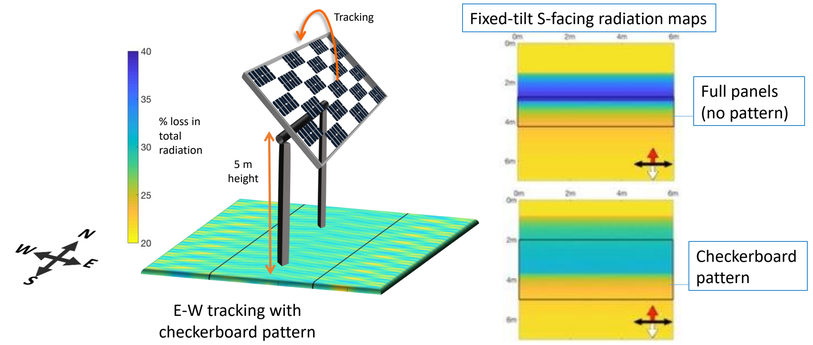
- Agrivoltaic, or agrophotovoltaic, is one strategy to utilize locally collected sunlight towards co-production.
- There is a lack of easily accessible tools and models to simulate agrivoltaic systems.
- We set up a simulation tool based on optical simulations built by our group, utilizing open-sourced code from PVLib.

The agrophotovoltaic system in Heggelbach near Lake Constance in Germany.
("Agrophotovoltaics: Land use efficiency of up to 186 percent". Accessed July 2019 from https://www.pveurope.eu/News/Solar-Generator/Agrophotovoltaics-Land-use-efficiency-of-up-to-186-percent)

Methodology



Results and Analysis



Illustrations adapted from A. Perna, PVSC (2019)

Conclusion

- Agrivoltaic is a promising solution to sustainable supply of food and energy resources for a growing population.
- We built a tool on nanoHUB.org, 'agpvsim', to aid users in designing dual-use farms which can be found in https://nanohub.org/resources/agropvsim.
- This tool can calculate and plot power output, energy shadow maps and irradiance models.

Reference

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