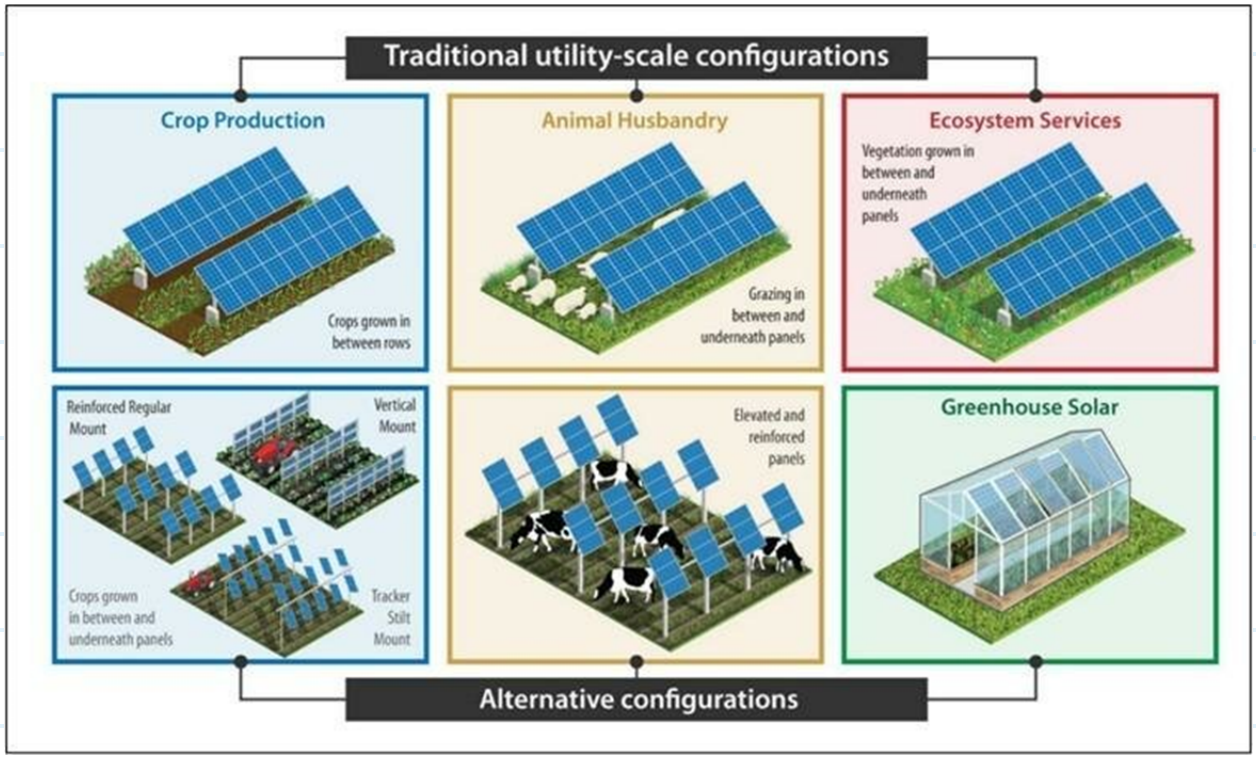
Agrivoltaics Canada Conf. 2023

- dual use of land for PV and agriculture OR colocation of PV with farmland



6 Common Configurations for Ag.V.

Source Fig.: https://www.researchgate.net/figure/Three-basic-forms-of-agrivoltaics-8_fig1_371043340

Stilt Mounted Agrivoltaics

Between the Rows Agrivoltaics

Agrivoltaic Greenhouse

3 main system designs for Agv.

Source: https://www.voestalpine.com/sadef/en/Markets/Solar/AgriVoltaics
Source: https://www.crtsgroup.com/en/engineering_talks/photovoltaic-greenhouses-smart-use-of-the-land/

* Land equivalent ratio > 1 → Agv. is better option than conventional agriculture

Before Agv

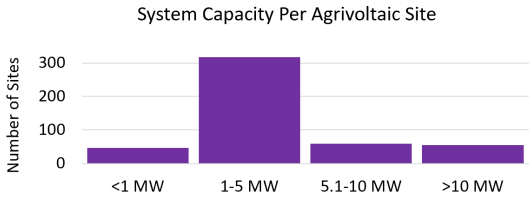
After Agv

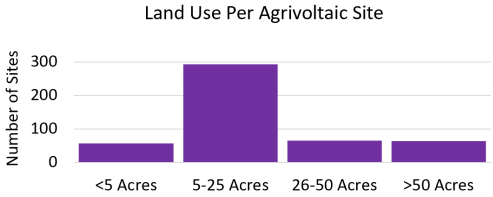
• https://doi.org/10.1063/5.0106454

US AgV Map Summary

	Number of Sites	Total MW	Total Acres	Total Hectares
Habitat	399	3,067	17,763	7,188
Grazing	127	3,552	26,492	10,720
Crop Production	26	14	73	30
Greenhouse	2	.04	.2	.08
Totals*	**477**	**6,633**	**44,329**	**17,939**

*Totals do not reflect the complete sum of the above categories as some sites have multiple agrivoltaic activities ongoing. These values are represented in their categories, but not duplicated in the sum totals.





Slide Credit: Jordan Macknick and Alexis Pascaris, National Renewable Energy Laboratory (NREL)

Canada

Open Access Article

The Agrivoltaic Potential of Canada

by Uzair Jamil [1], Abigail Bonnington [2] and Joshua M. Pearce [3,4,*]

1 Department of Mechanical and Materials Engineering, Western University, London, ON N6A 5B9, Canada
2 Department of Civil and Resource Engineering, Dalhousie University, Halifax, NS B3H 4R2, Canada
3 Department of Electrical & Computer Engineering, Western University, London, ON N6A 5B9, Canada
4 Ivey Business School, Western University, London, ON N6G 0N1, Canada
* Author to whom correspondence should be addressed.

Sustainability **2023**, *15*(4), 3228; https://doi.org/10.3390/su15043228

Submission received: 19 January 2023 / Revised: 5 February 2023 / Accepted: 8 February 2023 / Published: 10 February 2023

(This article belongs to the Section Energy Sustainability)

Download Browse Figures Versions Notes

Abstract

Canada has committed to reducing greenhouse gas (GHG) emissions by increasing the non-emitting share of electricity generation to 90% by 2030. As solar energy costs have plummeted, agrivoltaics (the co-development of solar photovoltaic (PV) systems and agriculture) provide an economic path to these goals. This study quantifies agrivoltaic potential in Canada by province using geographical information system analysis of agricultural areas and numerical simulations. The systems modeled would enable the conventional farming of field crops to continue (and potentially increase yield) by using bifacial PV for single-axis tracking and vertical system configurations. Between a quarter (vertical) and more than one third (single-axis tracking) of Canada's electrical energy needs can be provided solely by agrivoltaics using only 1% of current agricultural lands. These results show that agrivoltaics could be a major contributor to sustainable electricity generation and provide Canada with the ability to render the power generation sector net zero/GHG emission free. It is clear that the potential of agrivoltaic-based solar energy production in Canada far outstrips current electric demand and can, thus, be used to electrify and decarbonize transportation and heating, expand economic opportunities by powering the burgeoning computing sector, and export green electricity to the U.S. to help eliminate their dependence on fossil fuels.

Keywords: agriculture; agrivoltaic; climate policy; Canada; energy policy; farming; land use; photovoltaic; solar energy; renewable energy

* Quebec is pioneer in moving forward in REs. They have implemented 10 GW of RE techs.

* In Alberta & Ontario, however, there are land legislations hindering development of AgV.

* Solar PV canopies in farms' parking lots are easiest choice toward AgV.

* Agrotunnel (a tunnel made of opaque material, in which some plants are growing with supplementary lighting powered by PVs) is another achievable option.

* Growing grazing animals such as sheeps

goats * cattle!

x they chew and go top of the panels!

x they damage panels!

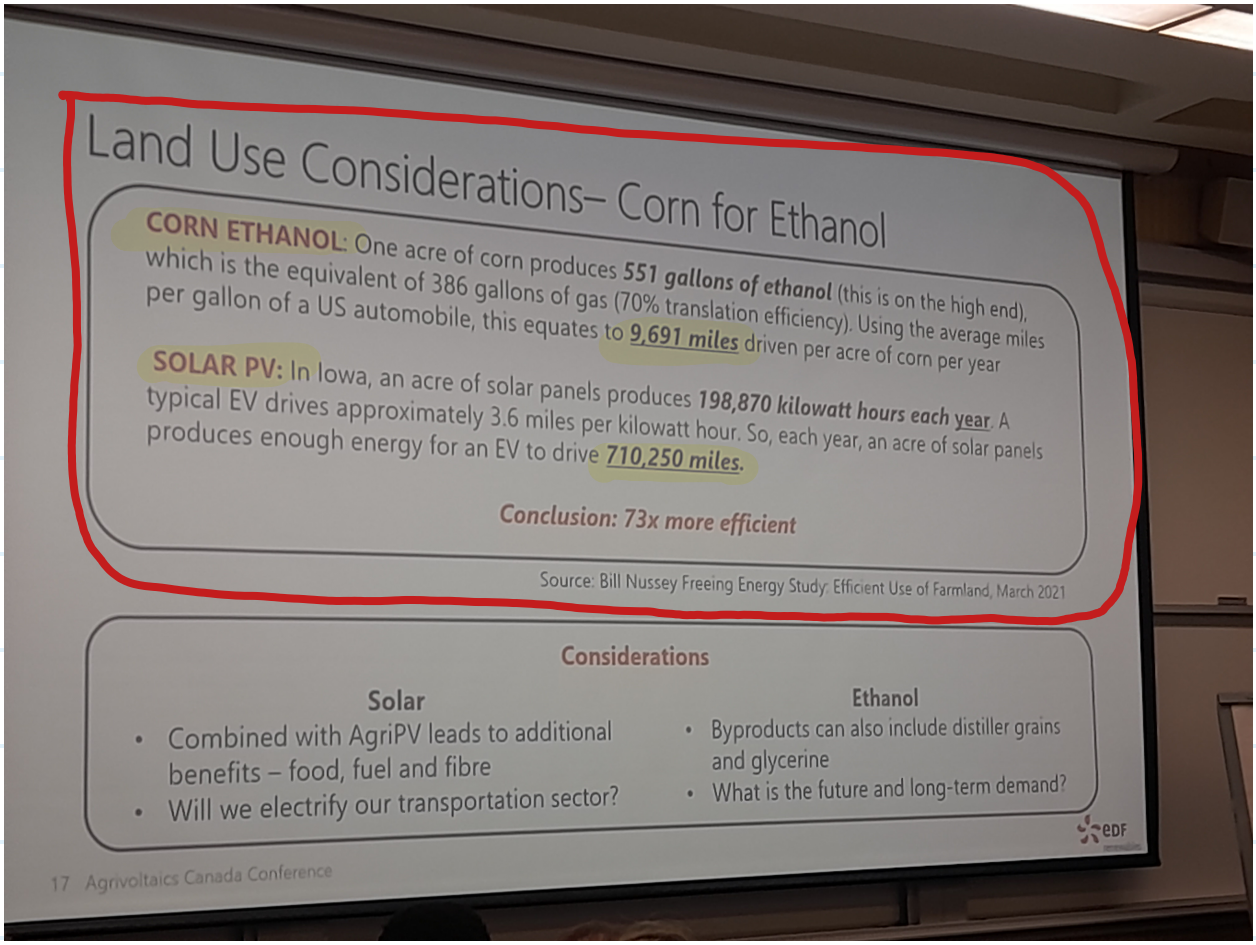
they are docile.

best option

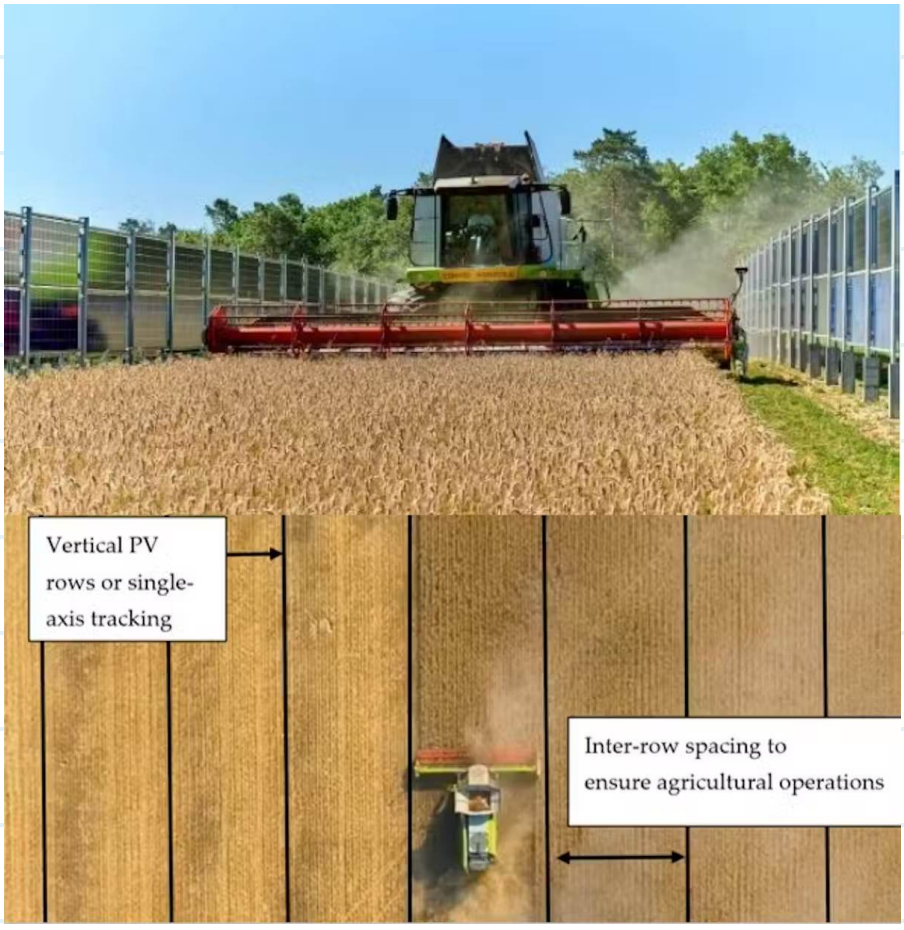
sheep growing is crucial in Canada due to the increment in population. However, we still import meet from Australia & Newsland.

* Some other growing techs such as EVs and HPs force us to provide more power.

↳ a good example with numbers



* Racking systems & panels need to be updated to be compatible with Agr applications. such as vertical rackings or umbrella type rackings.



Policies

* Still it is not allowed to install panels in farms.

* At this situation, having both of them is necessary: PV on the farm & Land

* We need to ask for first nations' help.

* We need to educate people & farmers that they are not gonna lose their farms by implementing Agv. projects.

* Social acceptance is the most important remaining issue.

Some other questions

* Efficiency reduction in harvesting due to the panels on the farm.

* wires and burying them under ground will make challenges in farming activities.