

COMBINING AGRICULTURE & SOLAR ENERGY: A DUAL-USE VISION FOR WASHINGTON



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INTRODUCTION TO AGRIVOLTAICS

Objective: Assess the potential of solar energy to meet diverse energy needs on Washington farms^{1,2}

Why: Agrivoltaics optimize agricultural land use by harnessing solar power while growing food (e.g. "dual-use solar").³ Washington needs to replace fossil-fuel and start using renewable and non-emitting energy sources by 2045 (CETA)⁴. Renewable energy can balance environmental and land-use policies in the state of WA to enhance energy independence, reduce carbon pollution and create economic opportunities in rural areas.



Figure 1: Map of Washington state with county lines and associated numbers of farms²

Where: Can be used on farmland to generate energy and reduce damaging sun exposure (e.g. fruit "sunburn"). Solar panels can also be used over reservoirs and irrigation canals.

How it is used: Placing solar photovoltaic panels over farmland helps reduce evaporation from the soil, and reduce irrigation requirements. Floating solar photovoltaic panels are placed over bodies of water and provide shade and help prevent evaporation.

Benefits and challenges: improved economics for farmers and other agricultural producers, ecosystem services such as maintaining soil health, and expanded siting opportunities for solar development. Farmers benefit by keeping agricultural land in production can help sustain rural economies and benefit local communities. Other benefits include:

- o adding farming to **existing** solar energy sites
- o reducing **irrigation requirements** (e.g. decreasing evaporation/transpiration from soil/plants)
- o improve **crop yield** and **crop resistance** in extreme weather, such as droughts, by reducing evapotranspiration
- o providing **cover to livestock**^{5,6}



- o providing **pollinator habitat**--in turn support **crop production**
- o reducing energy bills from **self-generation** of electricity
- o gaining additional income stream and **increased revenue security**, as well as
- o finding **new market opportunities** for shade tolerant crops
- o reducing environmental **mitigation investments** (e.g. lower maintenance and operations costs due to limited mowing needs, and increased solar energy production from the cooler air zone created under modules from vegetation)

The main barriers that may prevent solar developers from implementing dual-use installations are higher initial installation costs because of the need for modified system structures and more complex design, for example needing to raise panels to accommodate tall vegetation or grazers. Other barriers include uncertainty on how to implement it, and lack of information on which crops may be suitable.

[ref #3: WSU Energy Program]

Future work: determine accurate energy use during farming operations and post-harvest processes

WASHINGTON SOLAR ENERGY PRODUCTION

Bridging the gap in solar energy production can strengthen Washington's goal for replacing fossil fuels¹

Washington state solar energy production was **0.5 MW** from 2012 to 2015, rising to **19.7 MW** in 2018, and then **23.4 MW** in 2020 rising sharply to **188.4 MW** in 2023 (Fig.2)¹

- o Klickitat county = **150 MW**¹
- o Adams, Kittitas, Benton, and Snohomish counties combined = **38.4 MW**

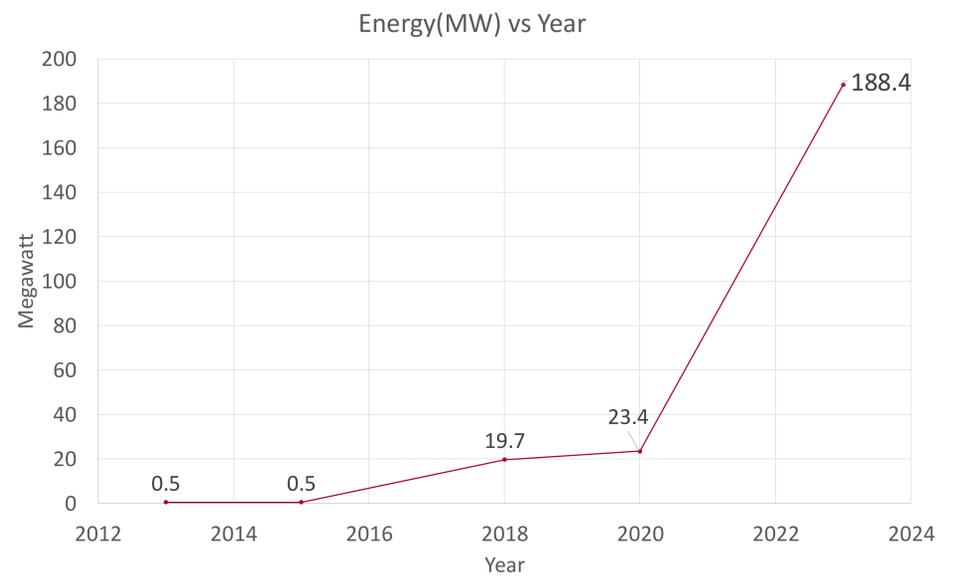
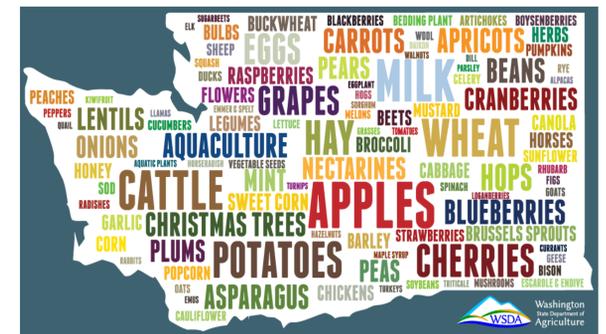


Figure 2: Washington state solar energy production in¹

WASHINGTON AGRICULTURE + COMMODITIES

Rich soils, diverse climates and large-scale irrigation make Washington state one of the most productive agricultural regions in the world.

- o WA produces over **300** different crops²



Agricultural production, food processing, and trade represent a significant segment of the state's economy.²

- o **Apples** are the leading commodity for Washington (67% of U.S. production), generating **\$1.991 billion**²
- o Livestock products, like **cattle and milk**, combine to make **\$2.663 billion**²
- o **Potatoes** generate **\$1.60 billion**²

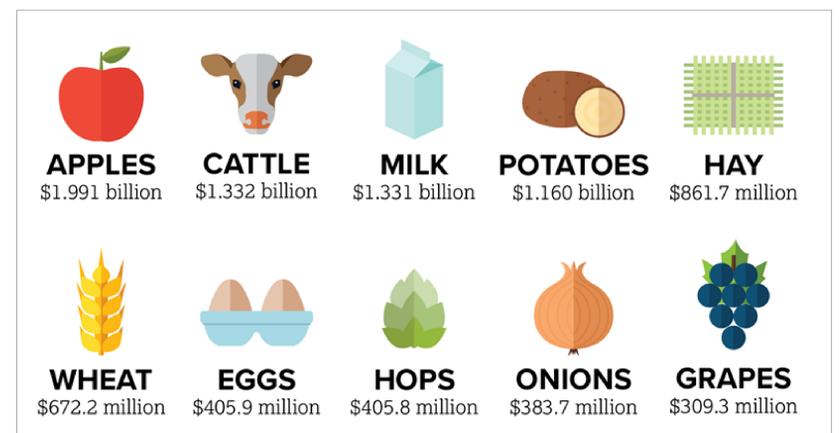


Figure 3: Washington state agricultural economic contribution by product²

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