

# Lincoln University Agrivoltaics project

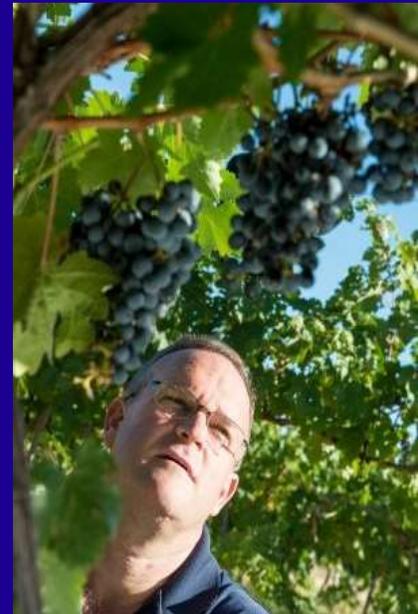
**Dr Shannon Page**

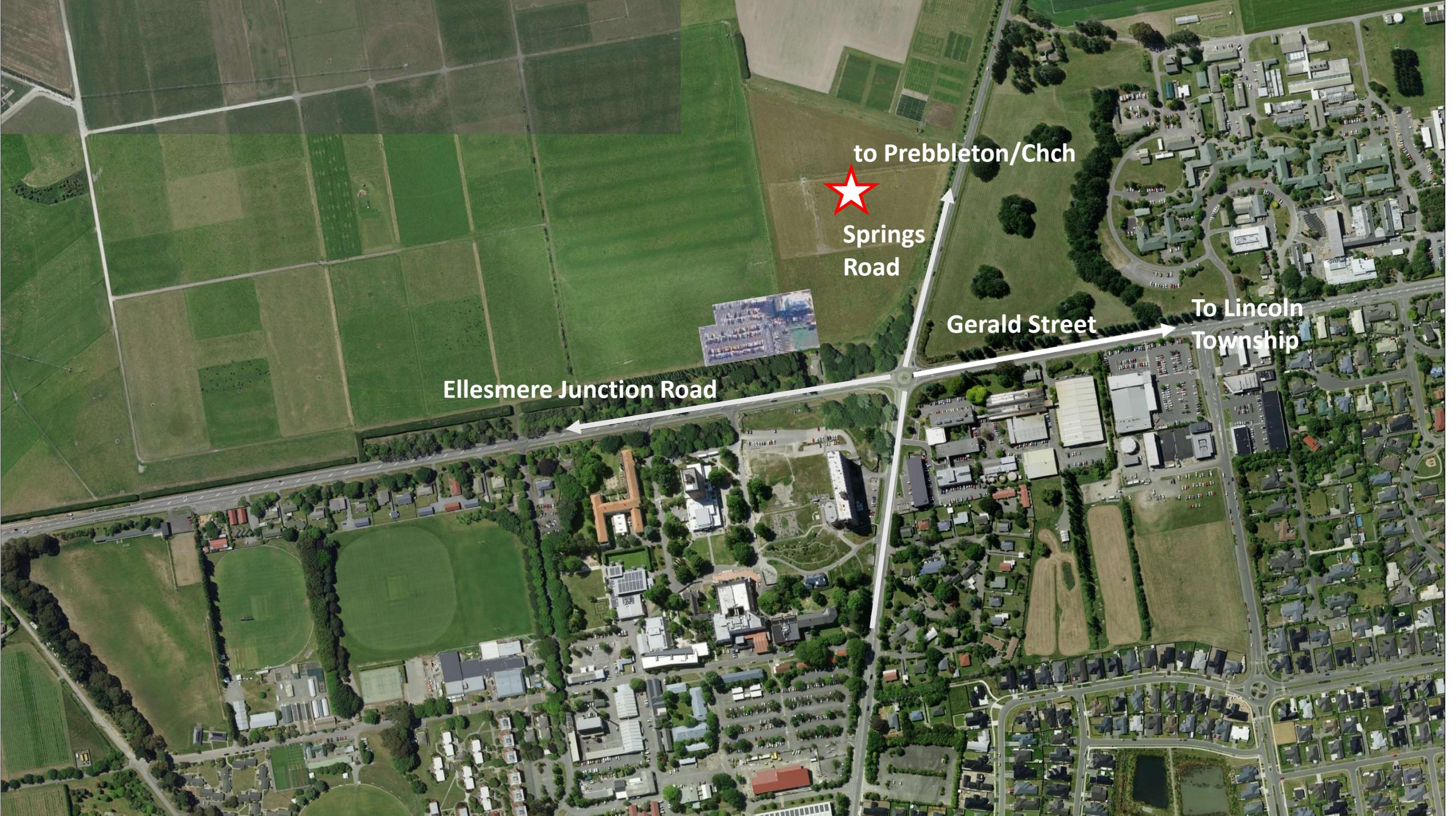
**Prof. Wim de Koning**

**Assoc. Prof. Amber Parker**

**Assoc. Prof. Clive Kaiser**

**Dr Pieter-Willem Hendriks**





to Prebbleton/Chch



Springs  
Road

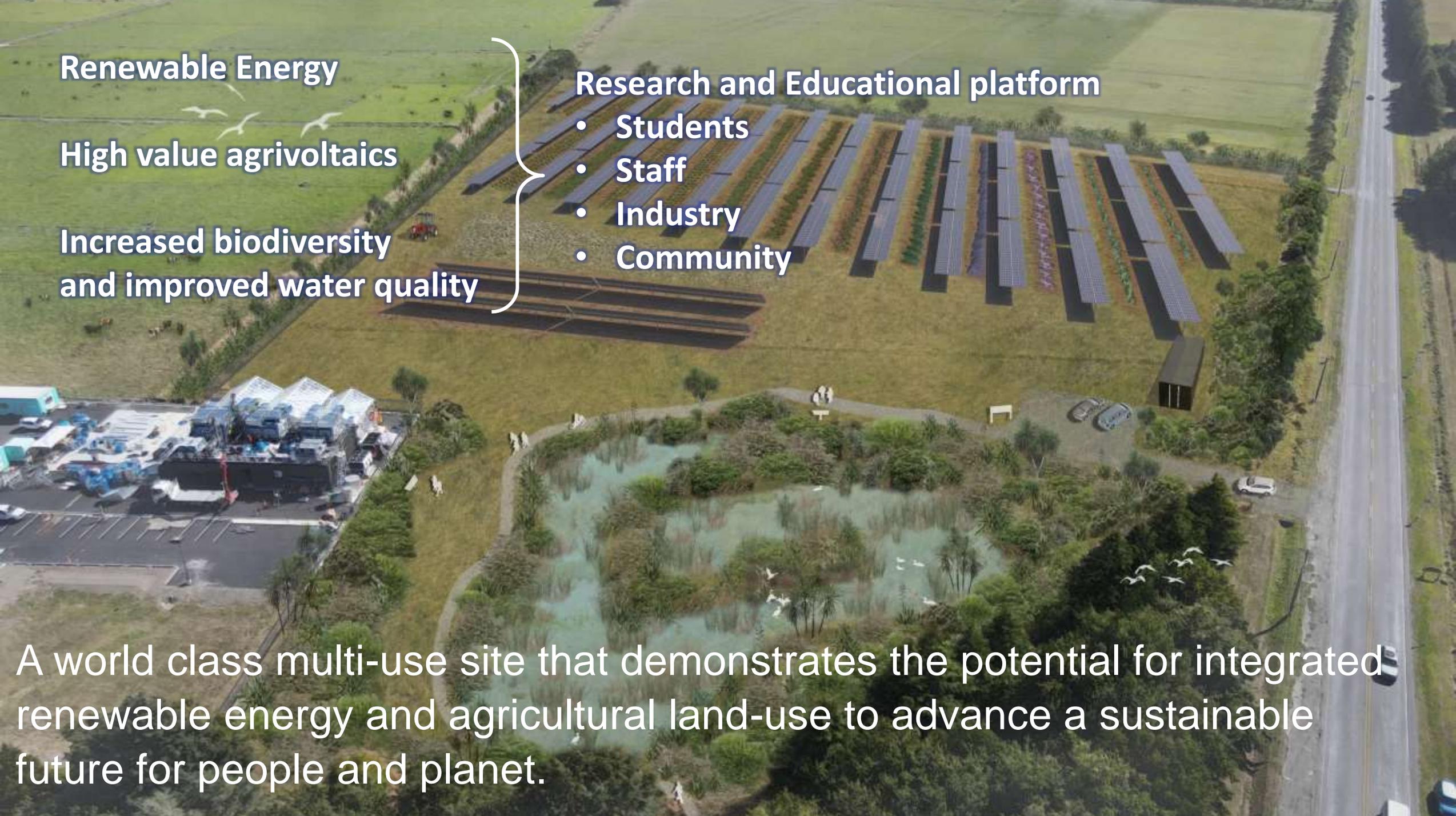
Gerald Street

To Lincoln  
Township

Ellesmere Junction Road





An aerial photograph of a multi-use site. In the upper half, there are several rows of solar panels installed in a field. Some rows have crops growing between them. To the left of the solar panels is a large green field with some animals. In the lower half, there is a wetland area with water, reeds, and several white birds. To the left of the wetland is a building with a blue roof and a parking lot. A road is visible on the right side of the image.

**Renewable Energy**

**High value agrivoltaics**

**Increased biodiversity  
and improved water quality**

**Research and Educational platform**

- **Students**
- **Staff**
- **Industry**
- **Community**

A world class multi-use site that demonstrates the potential for integrated renewable energy and agricultural land-use to advance a sustainable future for people and planet.

# Renewable Energy

## Sustainability Plan

Carbon neutral campus by 2030

Carbon zero campus by 2050



# Renewable Energy

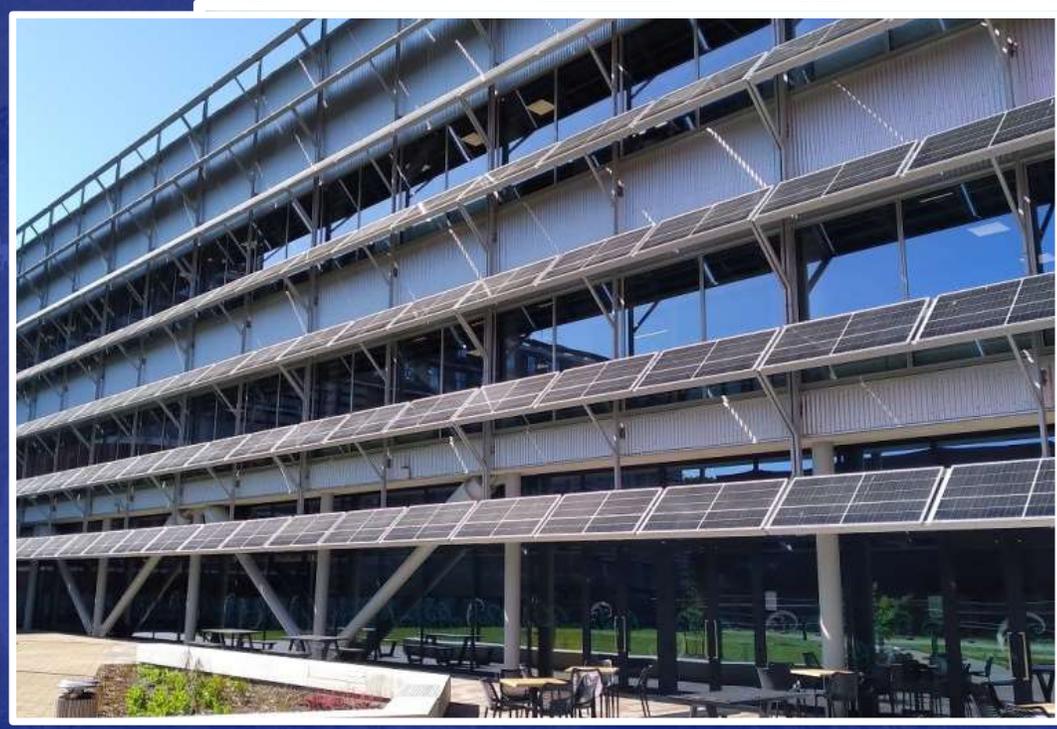
Roof top Solar – 637 kW, 712 MWh ~ 100 houses



# Renewable Energy

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Energy farm – 1,500 kW, 2,760 MWh ~ 385 houses



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Electrified transport



Air and ground source heatpumps

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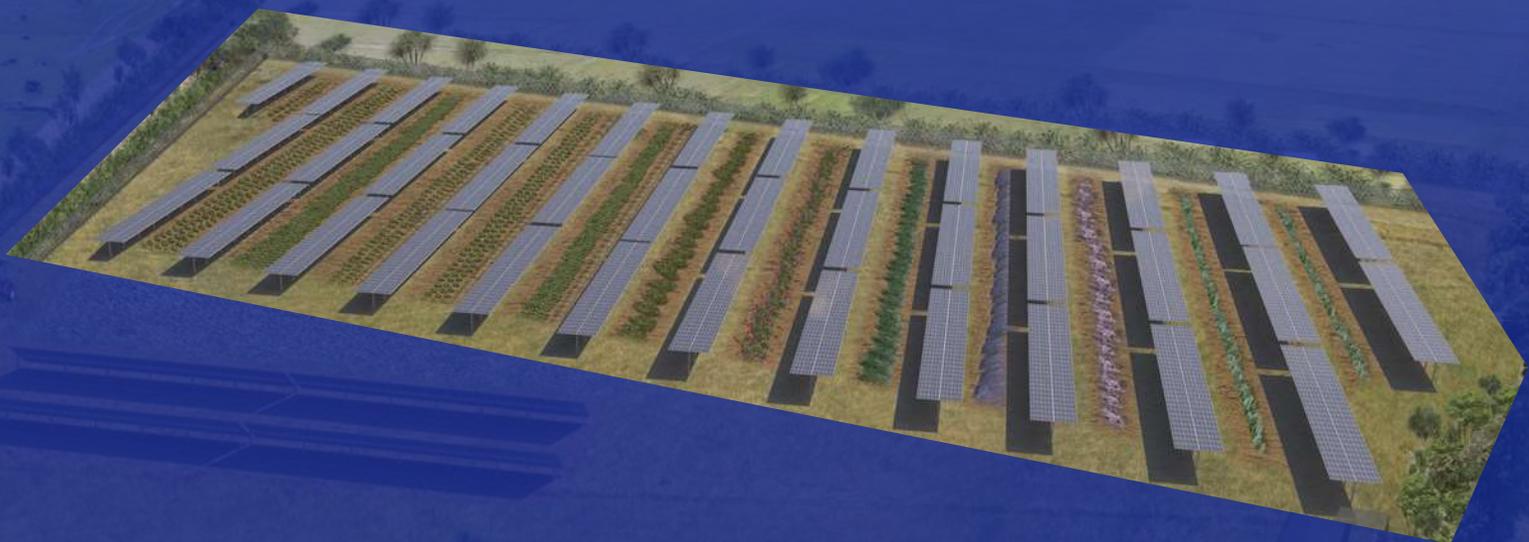


Electrified transport



Air and ground source heatpumps

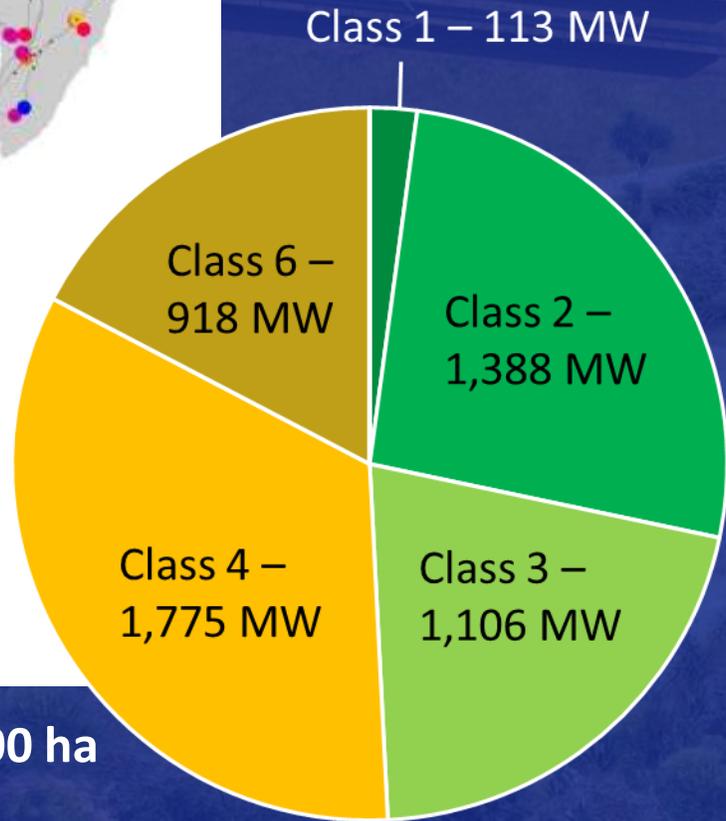
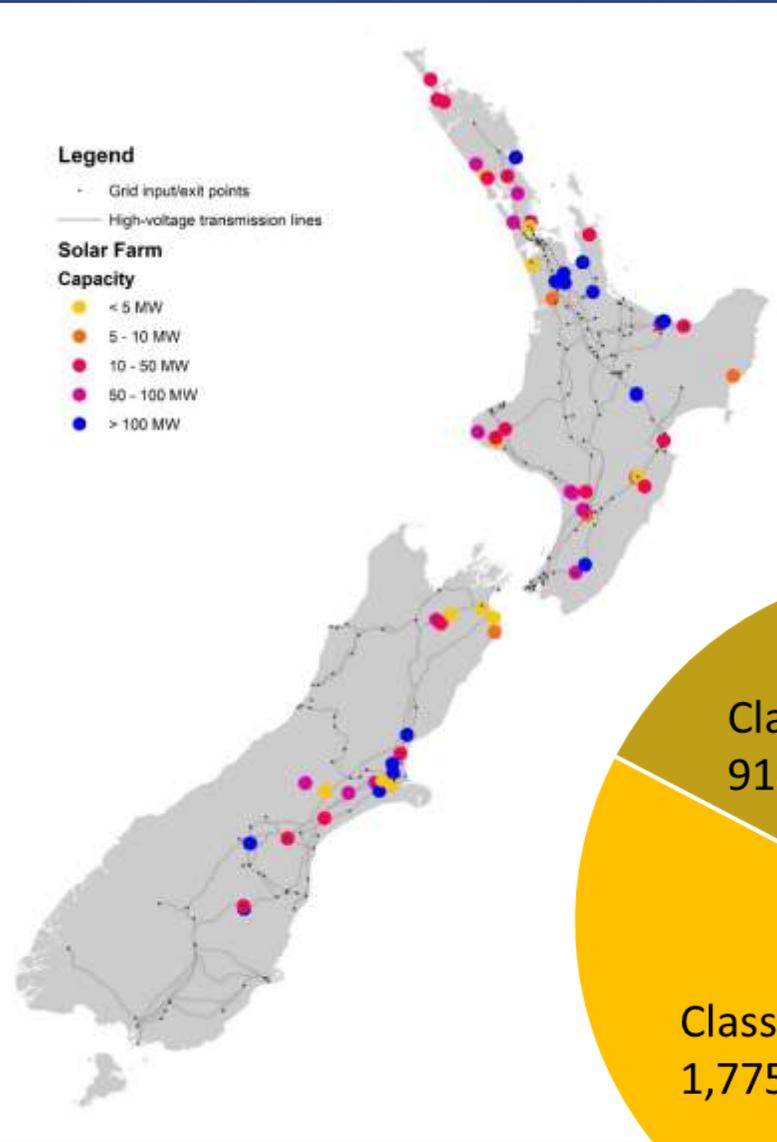
# High value agrivoltaics



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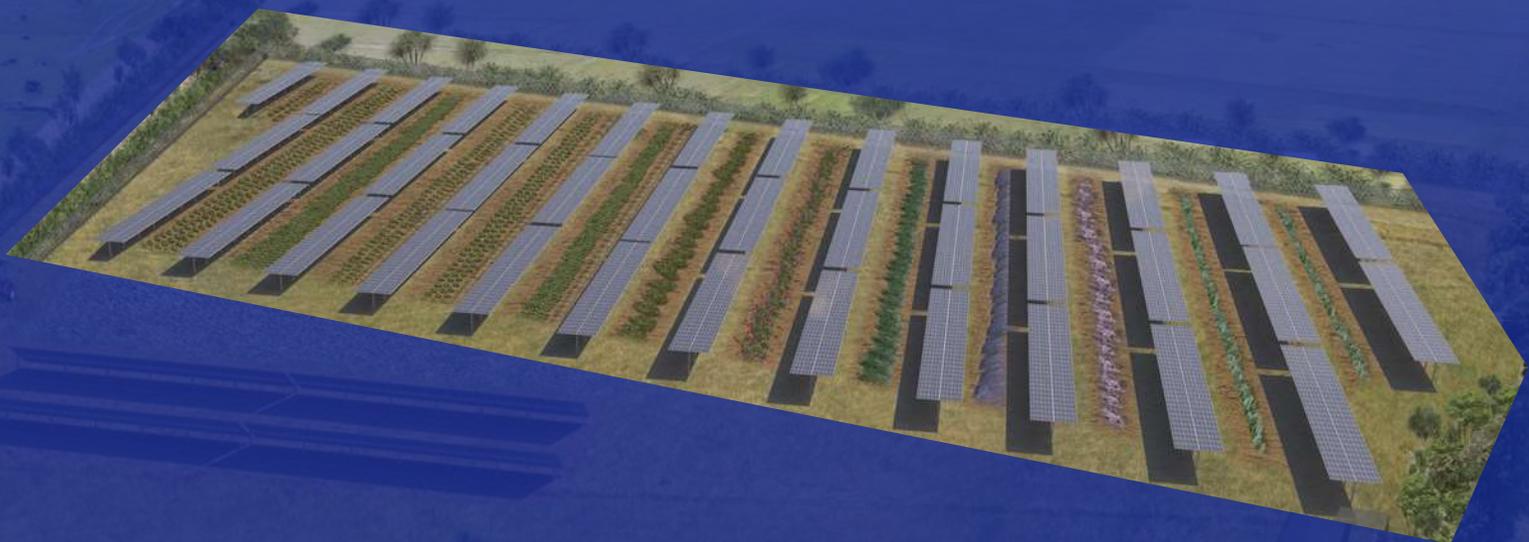
## Agrivoltaics

value of PV + Agriculture > value of PV or Agriculture alone

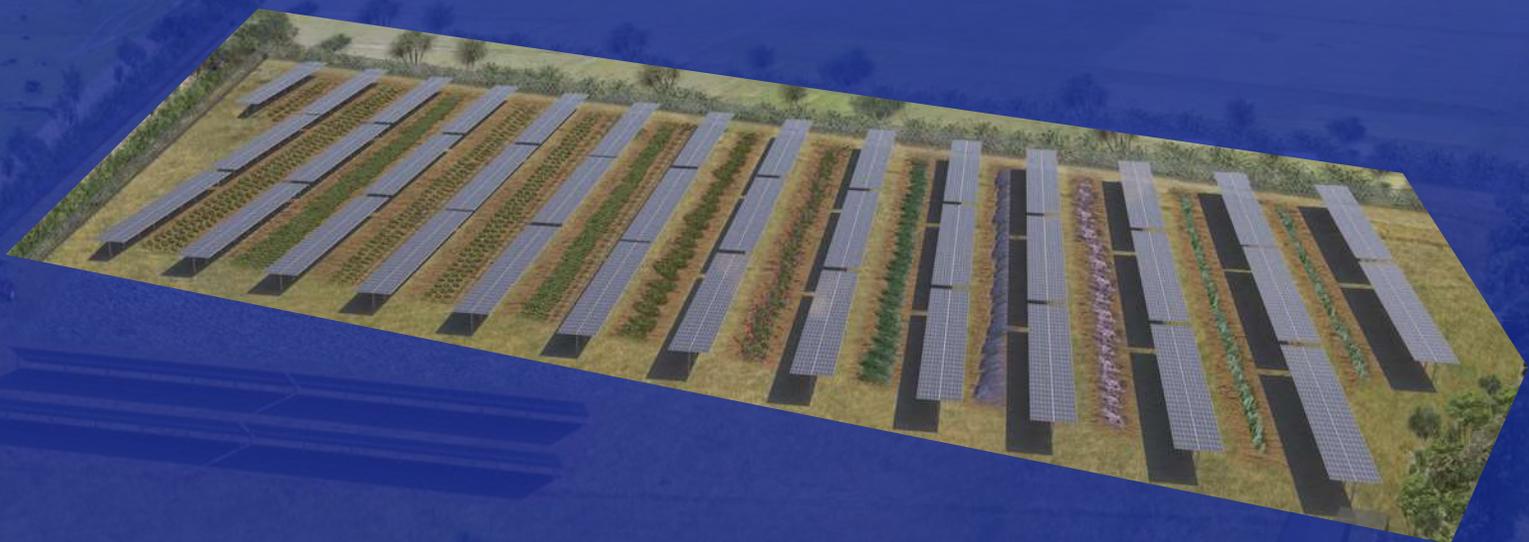


8,500MW by 2027 – 13,000 ha  
(Page S. et al 2024)

# High value agrivoltaics



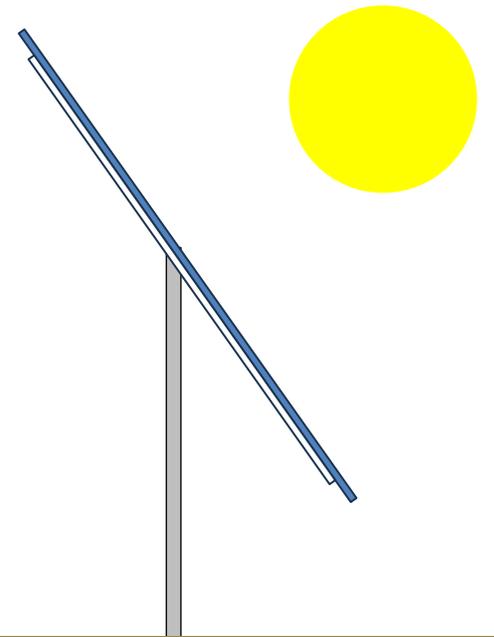
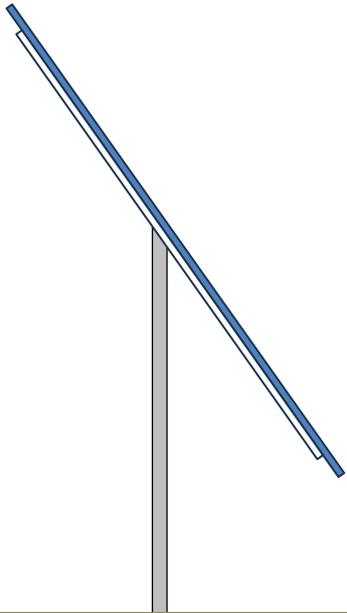
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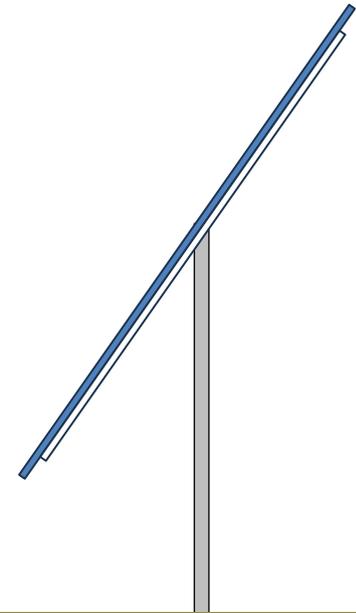
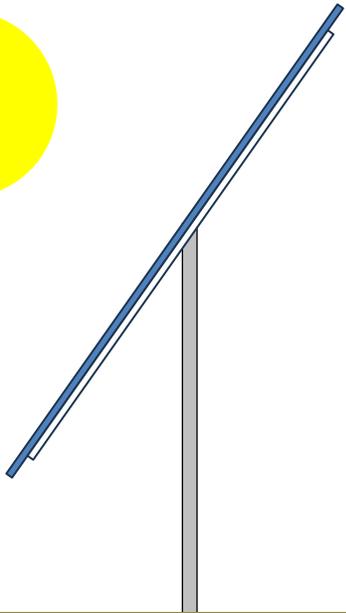
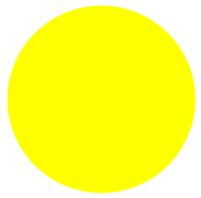
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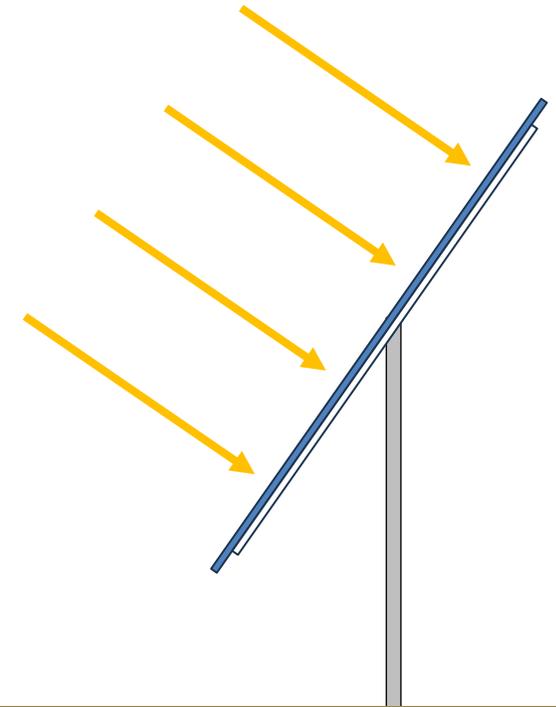
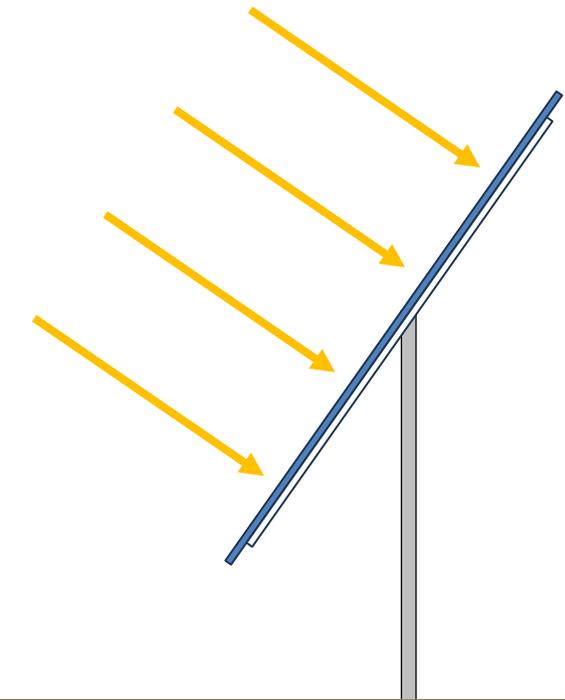
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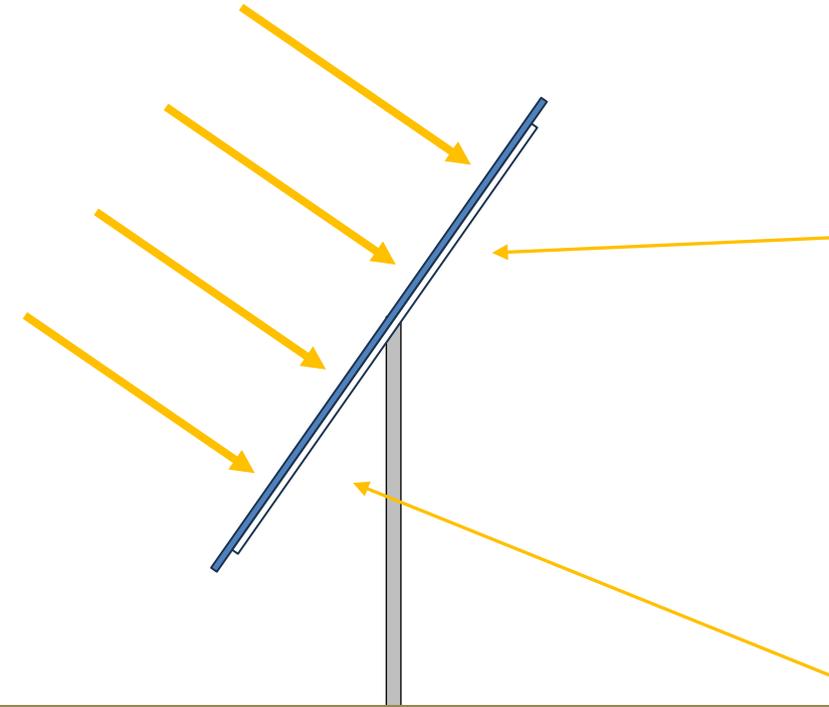
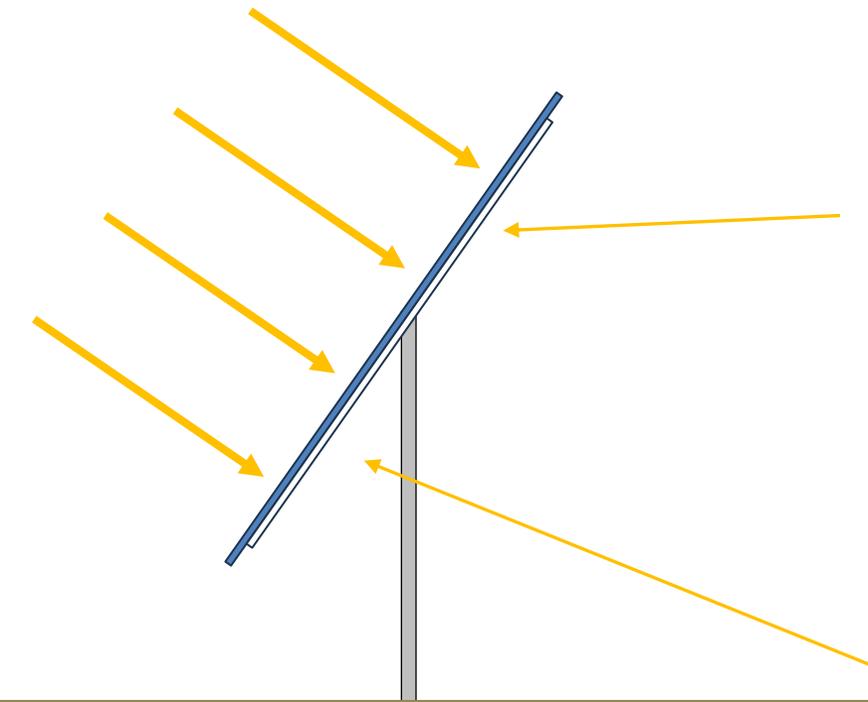
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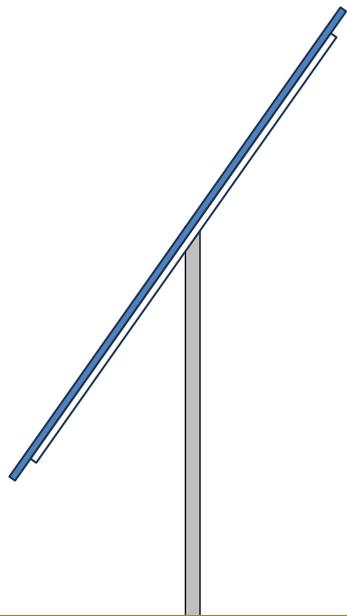
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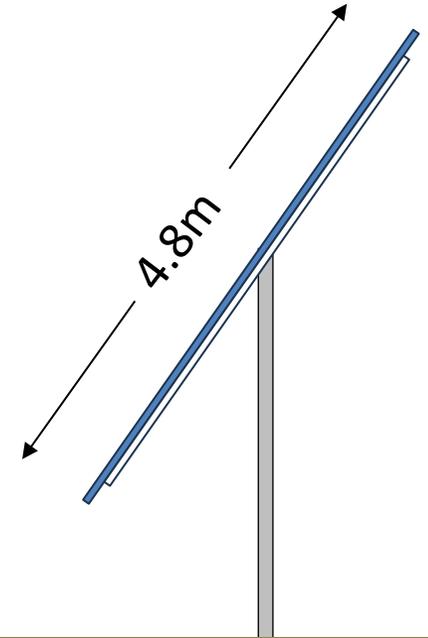
# High value agrivoltaics



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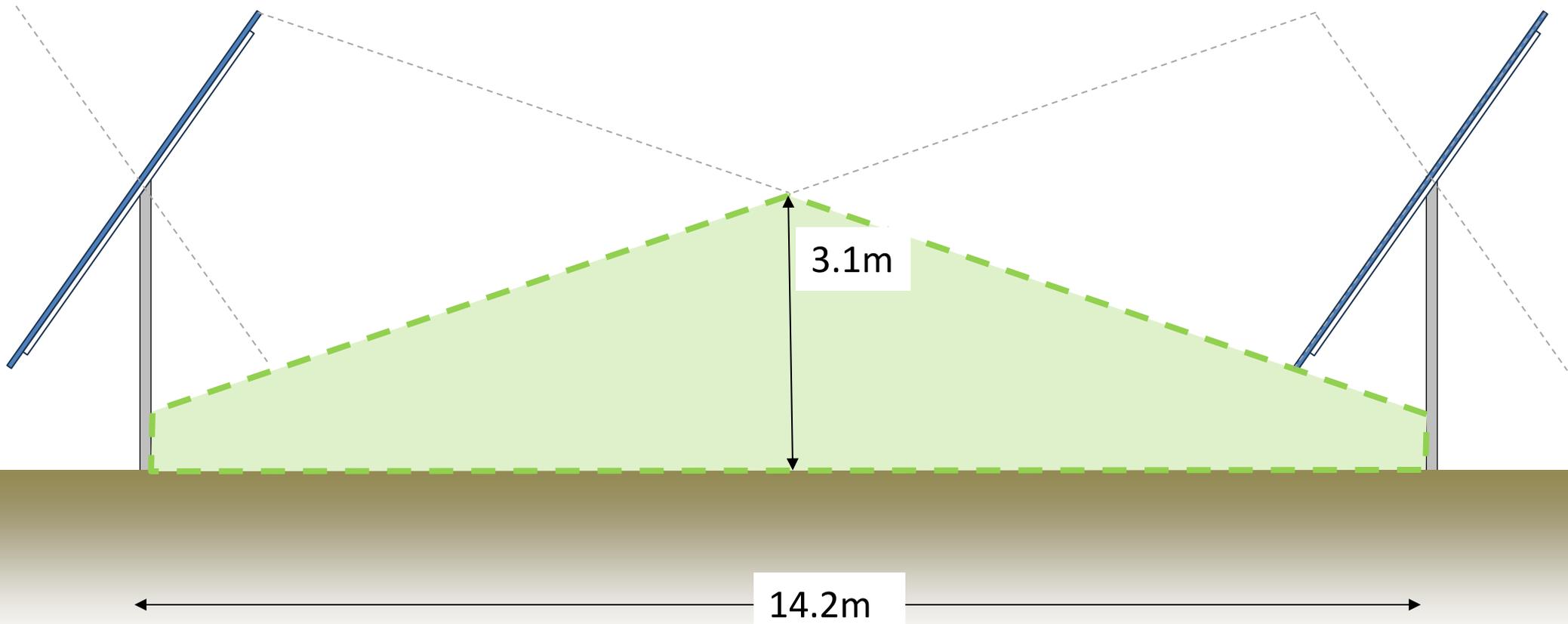


4.5m – 7 rows of panels closest to Springs road  
or  
5.1m - remaining 7 rows of panels

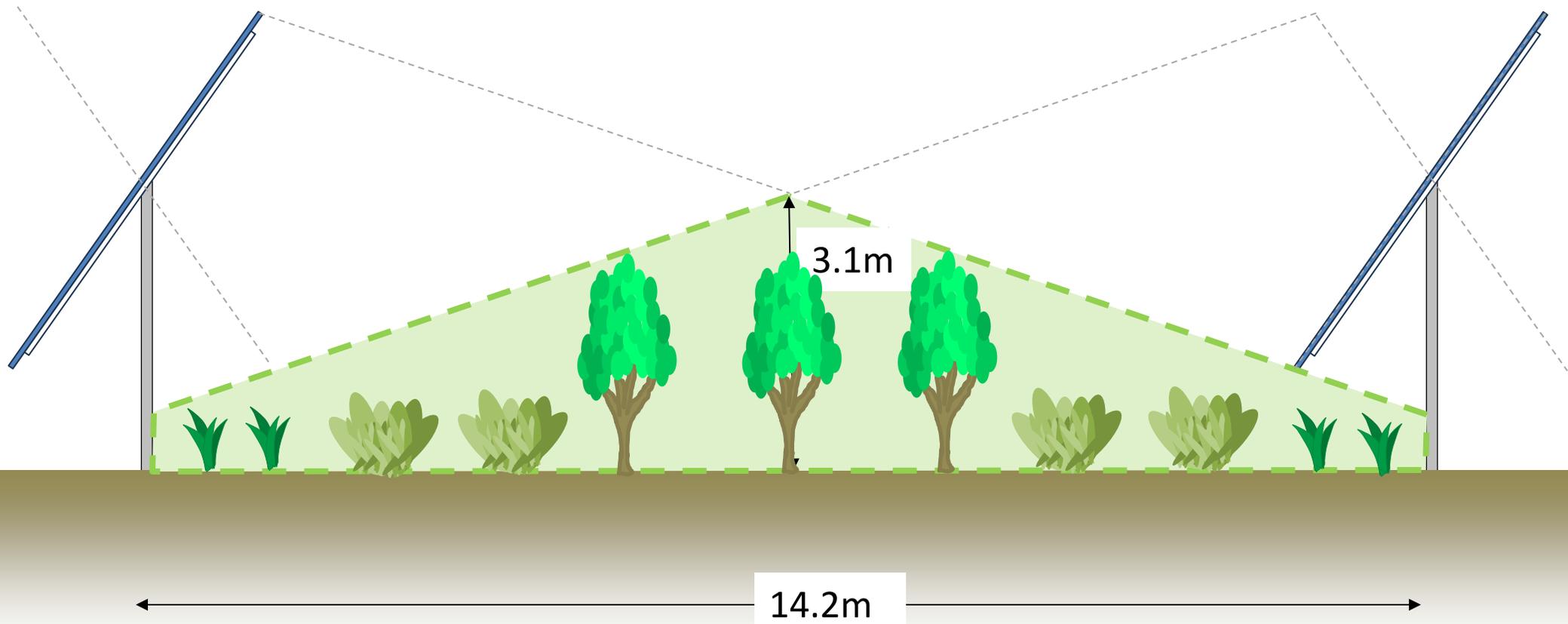


14.2m

# High value agrivoltaics

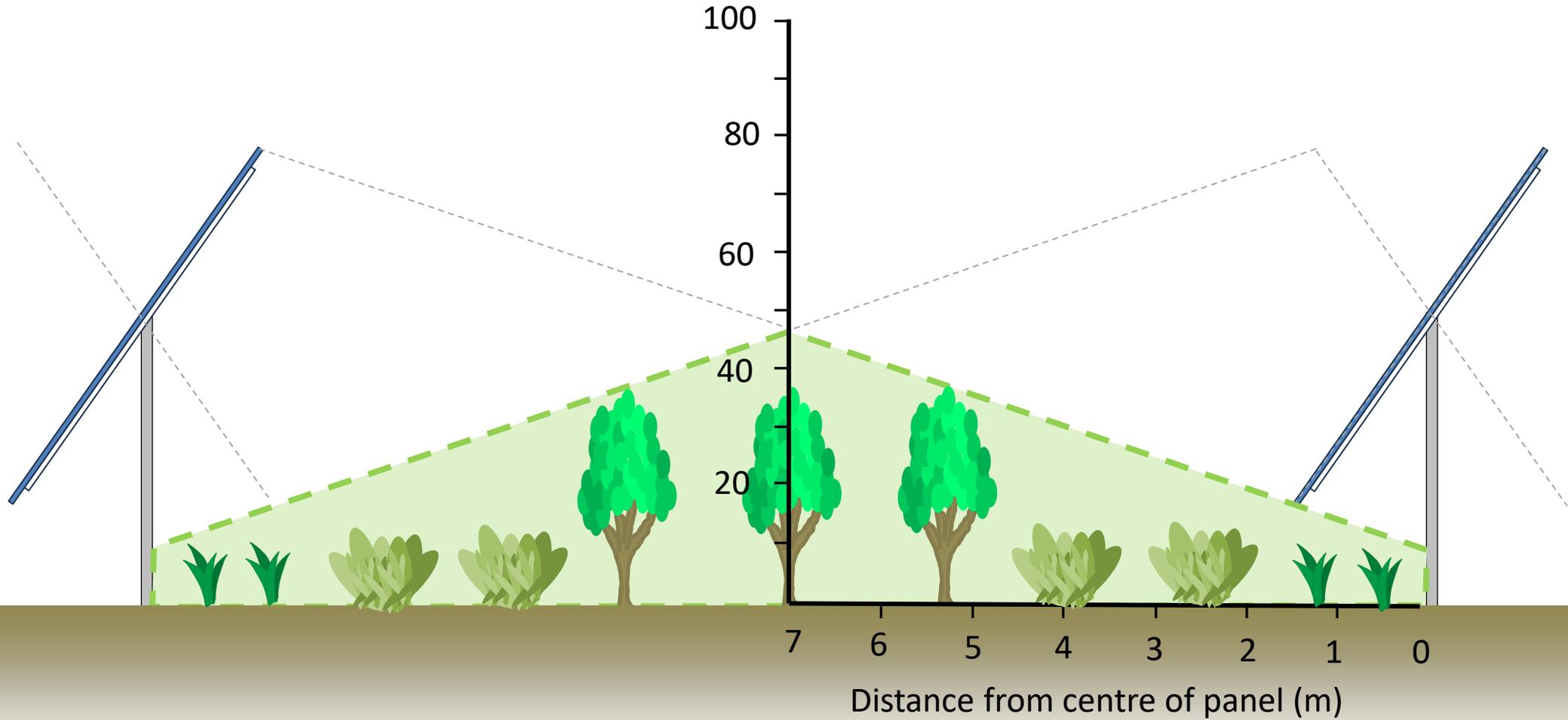


# High value agrivoltaics



# High value agrivoltaics

Total ground insolation  
(% of open field)

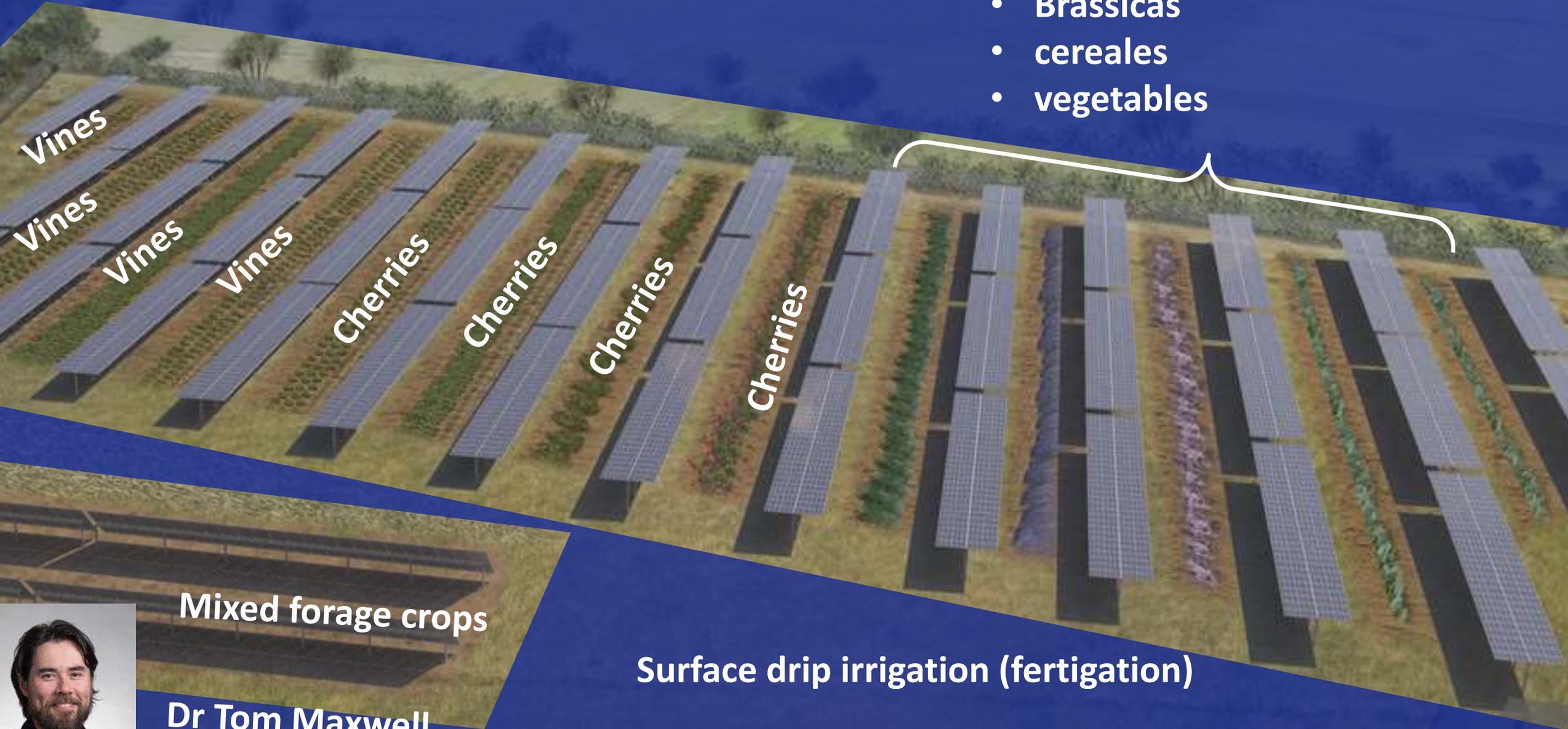




# High value agrivoltaics

## Rotational crops

- Brassicas
- cereales
- vegetables



Mixed forage crops

Dr Tom Maxwell

Surface drip irrigation (fertigation)

# Increased biodiversity and improved water quality



**Lauren Waller**



**Naomi Wells**



**Peter Almond**

# Increased biodiversity and improved water quality

## Boundary planting

- Screening
- Wind protection
- Increased ecosystem services

## Vegetated attenuation basin

- Sediment/nutrient trap
- Native planting around all water flows



# Research and Educational platform

- Students
- Staff
- Industry
- Community



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ENERGY EFFICIENCY & CONSERVATION AUTHORITY

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# Global Context



# Global Context

## Solar

- 5.5% of global total generation (2023)
- 24% growth rate
- wind at 8%, with a growth rate of 7%

## The transition (fossil fuels 70% of global GHG)

- Fossil electricity → Solar (and other renewables)
- Fossil heat and transport → electrified heat and transport

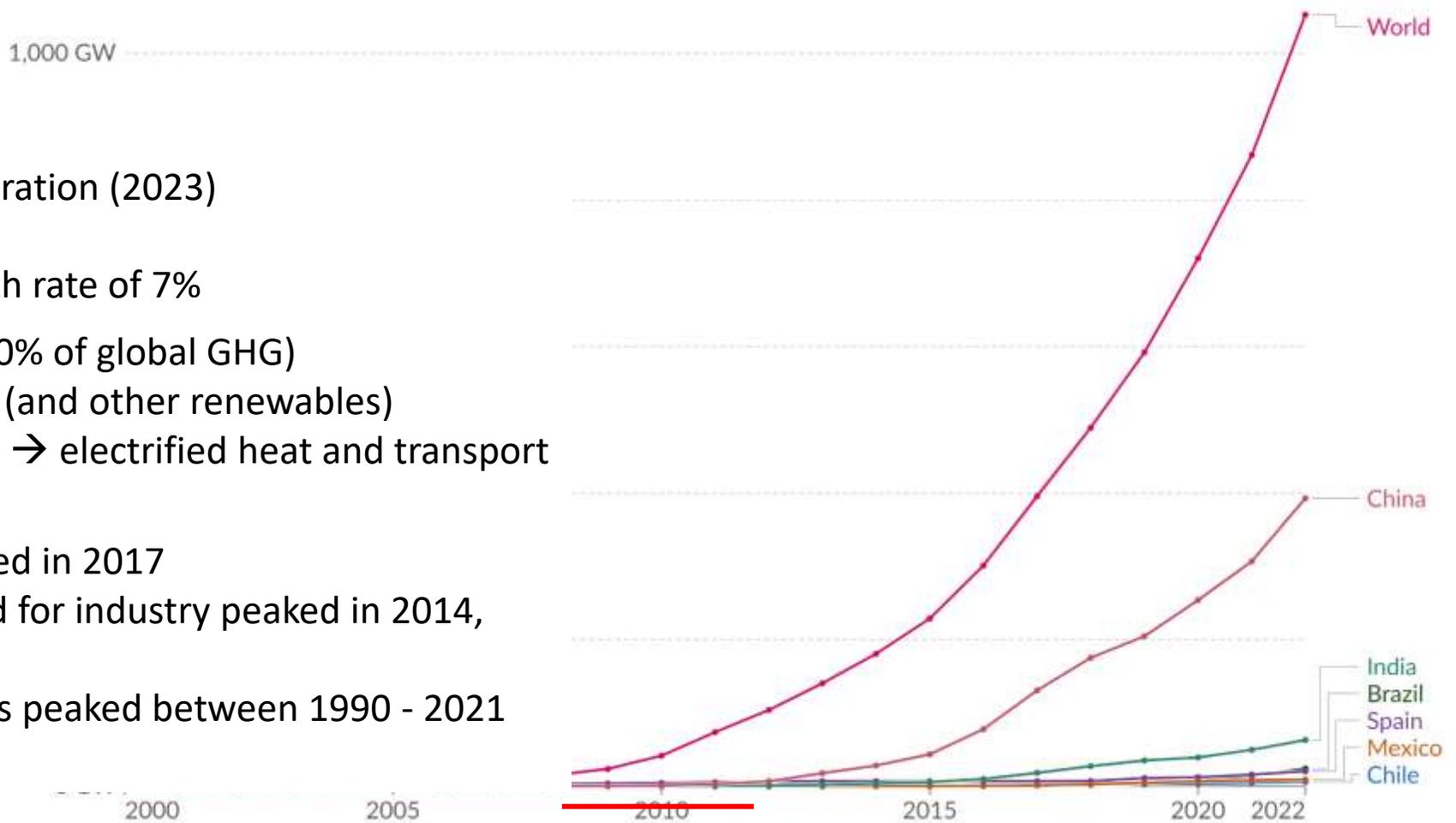
## Some results thus far

- Fossil fuel car sales peaked in 2017
- Global fossil fuel demand for industry peaked in 2014, and in buildings in 2018
- Most global air pollutants peaked between 1990 - 2021

## Installed solar energy capacity

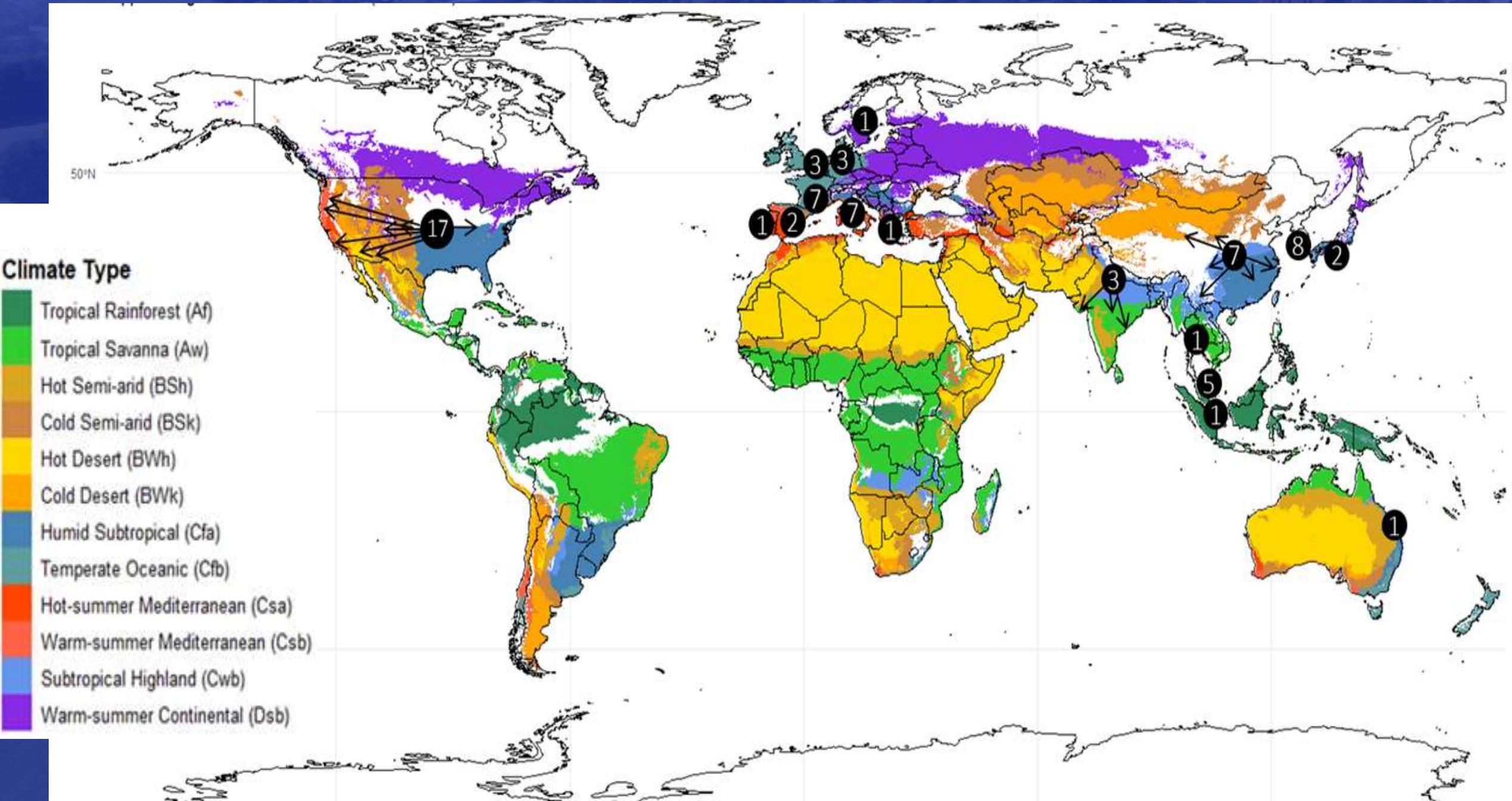
Cumulative installed solar capacity, measured in gigawatts (GW).

Our World  
in Data



Data source: International Renewable Energy Agency (2023)

OurWorldInData.org/renewable-energy | CC BY



# Useful contacts around this project:

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**Amber.Parker@lincoln.ac.nz --- Viticulture**

**Tom.Maxwell@lincoln.ac.nz --- Fodder/Pasture**

**Naomi.Wells@lincoln.ac.nz --- Water quality**

**Peter.Almond@lincoln.ac.nz --- Soil Science**

**Lauren.Waller@lincoln.ac.nz --- Agroecology**

**Pieter-Willem.Hendrik@lincoln.ac.nz --- Agronomy**