



What are New Zealand's efforts and plans for implementing agrivoltaics?

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What are Agrivoltaics?

Combining the use of land for agriculture and photovoltaic purposes



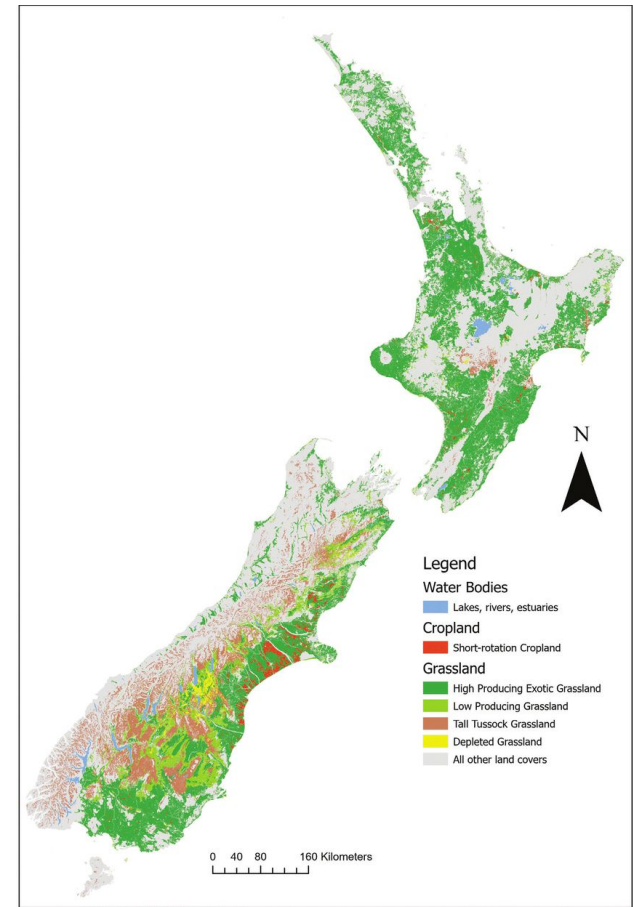
<https://www.pv-magazine.com/2020/03/31/a-good-year-for-solar-agrivoltaics-in-vineyards/>



<https://kerrcenter.com/power-from-pasture-panels-agrivoltaics/>

Introduction

- 40% of New Zealand's land is dedicated to pastures
- Residential expansion into highly productive land
- The total area of land used for agriculture has reduced by 1,878,409 hectares (14%) between 2002 and 2019
- Dairy cattle numbers have more than doubled since the 1980s



<https://www.stats.govt.nz/news/new-report-shows-impact-of-demands-on-land-in-new-zealand/>

https://www.researchgate.net/figure/Map-of-New-Zealand-showing-the-geographic-distribution-of-the-grassland-and-crop-land_fig1_352040220

Additional Benefits of Agrivoltaics

- Vegetation surrounding modules limits “heat island” effect
 - Improved solar energy production (PV surface ~9°C lower)
- Reduction of direct sunlight exposure beneath panels
 - Cooler air temperatures during the day, warmer air temperatures during the night
 - Increased moisture retention for plants
 - Significant water savings
 - Improved environment for grazing animals
- Improved soil health
 - Reduce erosion



New Zealand's Total Operational Electricity Generation Capacity:

9,761 MW = 9,761,000 KW

The Potential of Agrivoltaics in New Zealand

- ~14,000,000 hectares of agricultural land
 - = $1.4 \times 10^{11} \text{ m}^2$

$$\text{Size (kW)} = \text{Array Area (m}^2\text{)} \times 1 \text{ kW/m}^2 \times \text{Module Efficiency (\%)}$$

$$9,761,000 \text{ kW} = \text{Array Area (m}^2\text{)} * 1 \text{ kW/m}^2 * 0.16$$

$$\text{Array Area} = 6.1 \times 10^7 \text{ m}^2$$

$$1.4 \times 10^{11} \text{ m}^2 / (6.1 \times 10^7 \text{ m}^2) = 2294.8$$

- Only 1/2295 of agricultural land would be needed to be used as agrivoltaics to substitute the total current operational electricity generation capacity

Lauriston Solar Farm

Genesis Energy & FRV Australia
joint venture

- 90 hectare site
- 80,000 solar panels with a capacity of 50 MW
- 80 GWh a year (enough to power 10,000 households)
- Farmland sheep grazing to be introduced upon project's completion in 2024



FRV Solar Farm in Queensland

<https://www.genesisenergy.co.nz/about/news/genesis-and-frv-joint-venture-confirm-purchase-of-solar-site>

<https://www.pv-magazine.com/2023/02/07/agrivoltaic-project-set-to-become-new-zealands-first-utility-scale-solar-farm/#:~:text=New%20Zealand%20government%20Downed%20Genesis,first%20utility%2Dscale%20solar%20farm.>

Lodestone Energy - Farms

- 5 solar farms under development
- Lodestone Two is expected to be operational this fall
- Together will produce 400 GWh of energy
 - Enough to power 50,000 homes
- Designed to support continued agriculture activities around solar infrastructure
 - Over 85% of baseline farming yield expected
- Sites placed at the equivalent latitude of the Mediterranean and Southern California



<https://lodestoneenergy.co.nz/>

<https://www.pv-magazine.com/2023/04/13/construction-begins-on-32-mw-solar-farm-in-new-zealand/>

Māui Energy

- Startup developing solar scalable renewable energy farms in partnership with Māori landowners
- 1 MW - 5 MW projects
- Allows for Māori collective land owners to overcome any capacity and financial constraints which inhibit the development of their land
- Their goals: alleviate hardships in their communities, maximize land use, and provide economic prosperity
- Have plans for implementing agrivoltaics into their projects

<https://mauienergy.co.nz/about/>

<https://www.aucklandnz.com/invest/news/maui-energy-set-unlock-greater-economic-benefits-maori-communities-underutilised-land>

Limitations



- Agreements between farmers and companies
- Certain crops can be harder to farm due to increased difficulty in reaching with agriculture machinery
 - Mounting structure needs to be adjusted
 - 4-5 m to allow for large combine harvesters
- Issues with damage to panels & mounting structure through the use of pesticides

Questions?