Geoheat

Decarbonising covered crops

A collaborative research project to unlock New Zealand's geothermal heat potential for covered crop growers.

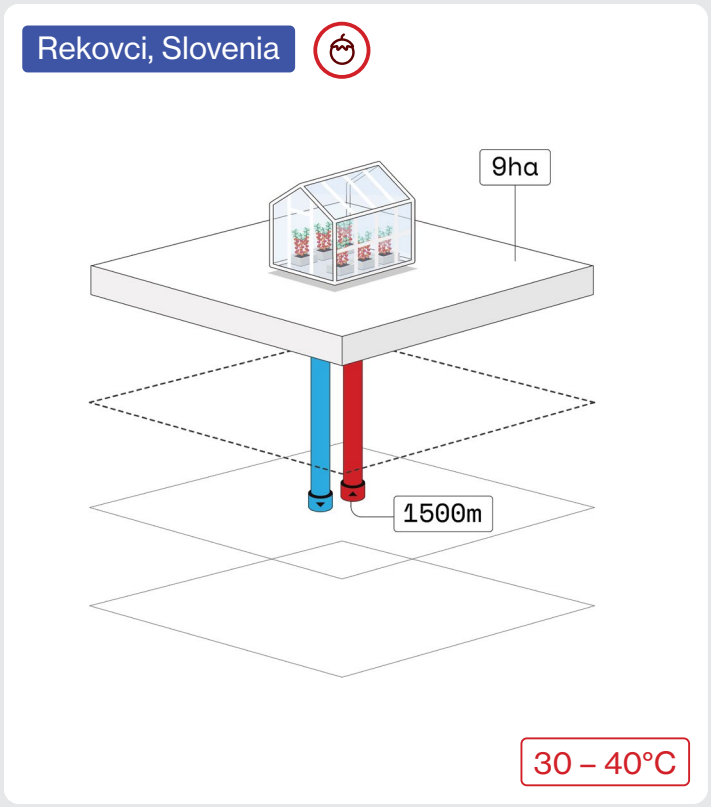
Scan the QR code for project updates and access to resource maps.

International examples of geothermal greenhouses

These examples are applicable to many areas of New Zealand, with temperatures potentially found at shallower depths.

Lušt Tomatoes

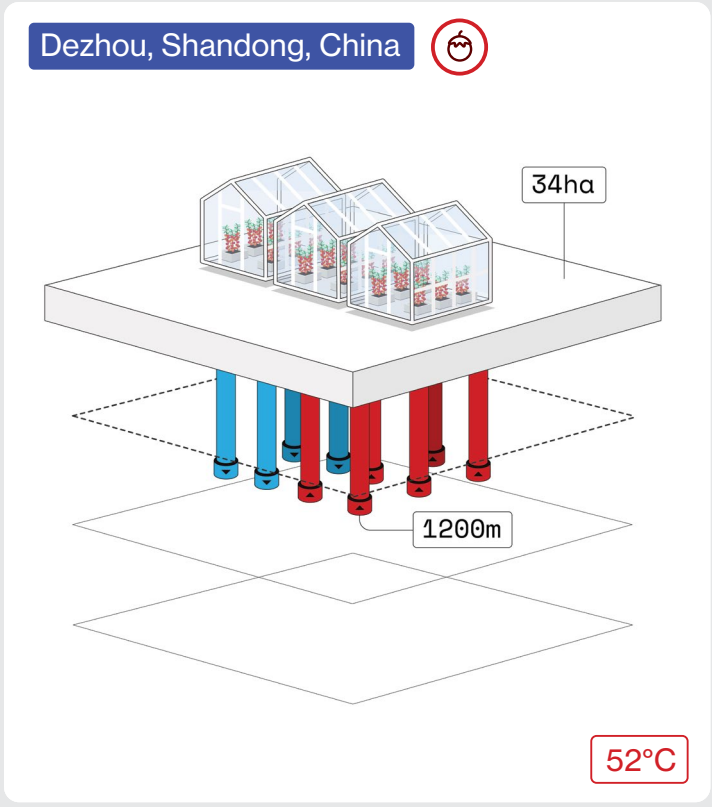
Until 2018 Lust's greenhouse supplemented geothermal groundwater (30-40°C from a 1,500m well) with gas. Rising gas prices and environmental demands led to their decision to replace the gas boiler with a 2000 kW ground source heat pump. This conversion delivers 65-80°C at a 72% operational savings and 50% lower CO_2 emissions. The system paid for itself in <1yr thanks to re-purposing the existing well. The system paid itself off with energy savings in under a year, helped by the geothermal well already existing on site. Lust's ground source heat pump doubles savings because it both heats the greenhouse and cools tomatoes in storage.



Example using existing warm groundwater source at 1.5 km

Caijin Smart Agricultural Industrial Park

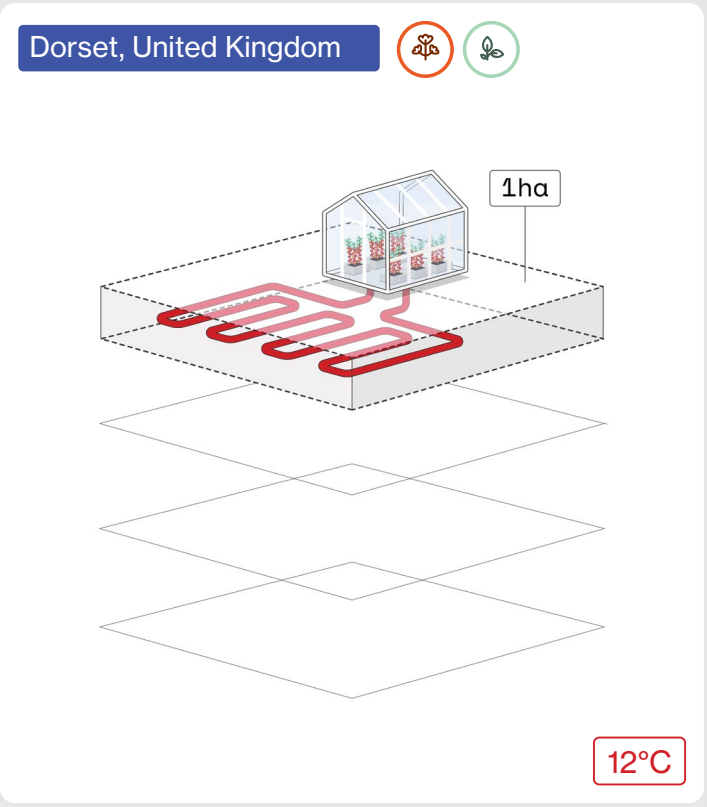
In an established growing region of Shandong, Caijin Smart Agricultural Industrial Park specialises in growing a variety of tomatoes. The park covers an area of 34ha and uses 52°C geothermal water from 1,200m deep wells to replace fossil fuel burning. It uses 4 extract wells and 6 return wells and it has added high-temperature ground source heat pump technology to operate an energy station. The total heating capacity is about 21,712kw. The smart agricultural greenhouse saves operating costs and reduces CO_2 emissions by 24,000 tons.



Example using a well field with moderate temperatures.

Stewarts Garden Centres and Nursery

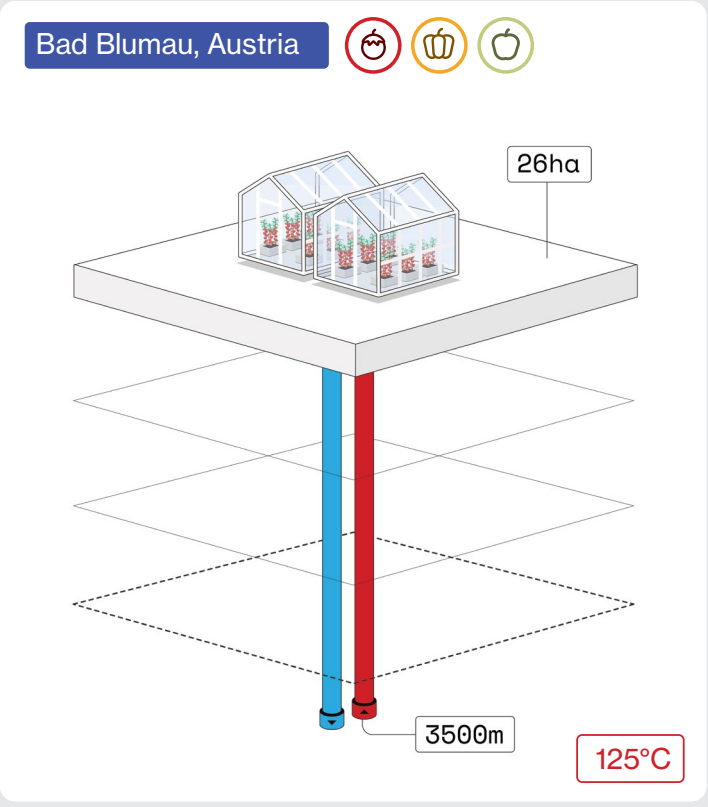
In 2020, Stewarts' dramatically changed its 280-year-old operation model to reduce costs and environmental impact. Inspired by Dutch growing facilities, they installed automated thermal screens and a 500kW ground source heat pump to replace an oil boiler. The system draws heat from a shallow closed-loop network of horizontal pipes that capture stable ground temperatures. The system has performed strongly, delivering annual savings of approximately 450 tonnes of CO2, equivalent and reducing electricity costs significantly.



Example using ambient ground temperatures.

The Frutura Group

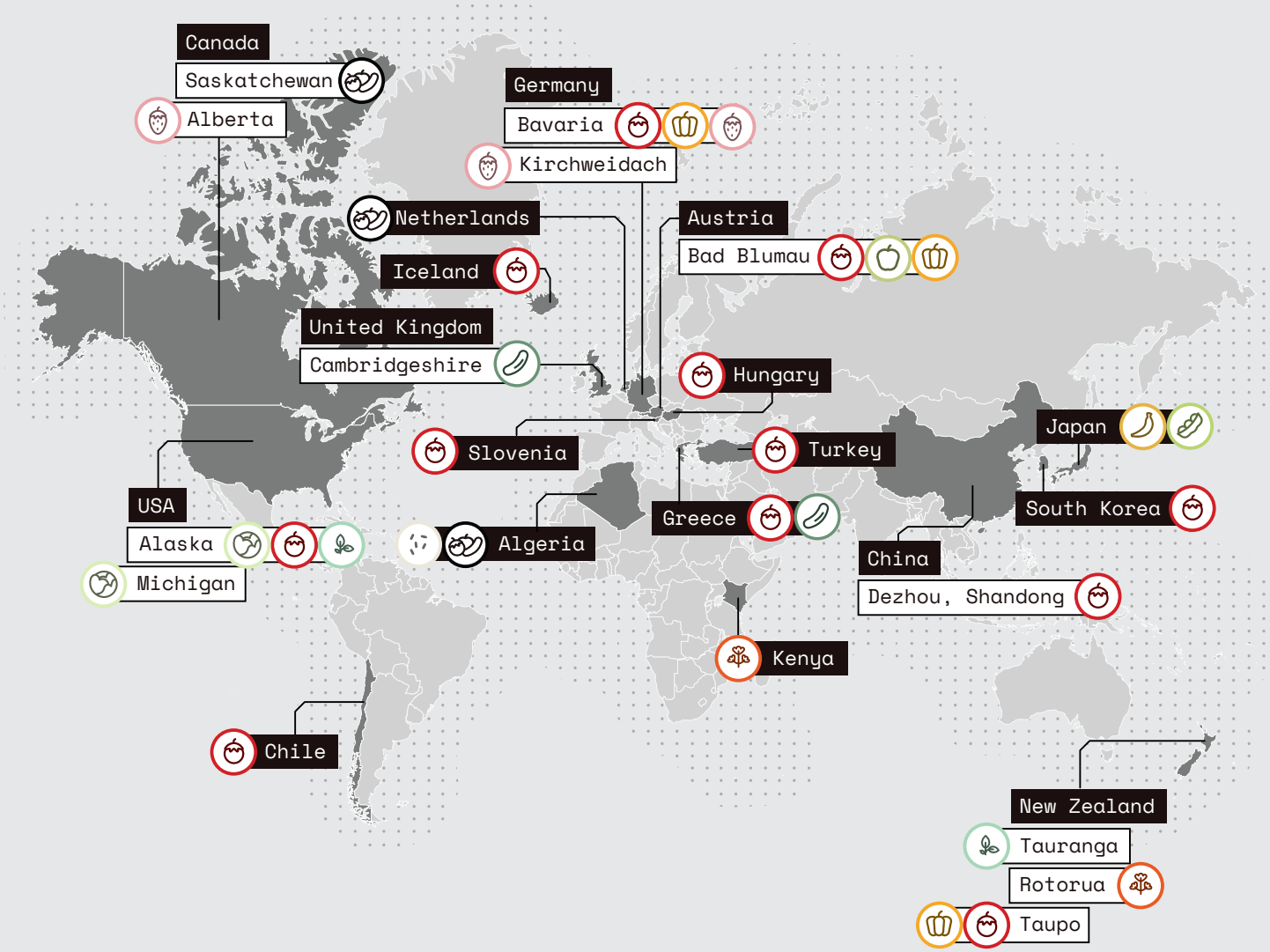
From 2016, Frutura began growing organic fruits, tomatoes and capsicums with geothermal energy. Geothermal water with a temperature of 125°C is pumped to the surface from a depth of 3,500m to heat 26ha of greenhouses so that produce can be grown all year round without any additional heating source. Compared to fossil fuel heating, 28,000 tons of CO_2 are saved per year. Frutura estimates that each year between October and March, 1 Million km of transport per truck can be avoided because of locally grown produce in geothermal greenhouses, further reducing CO_2 emissions and increasing food security.



Example of high temperatures from deep wells (> 3km).

Global Use of **Geothermal Heat for Covered Crops**

This selection of global examples includes the full geothermal spectrum, from facilities that use ambient groundwater with ground source heat pumps, to those that have drilled to greater depths to directly use >80°C. In each scenario, the use of geothermal has displaced fossil fuel use and enhanced regional food security.



- Bananas, coca dragon fruit
- Cucumbers
- Edamame Beans
- Flowers
- Fresh herbs
- Organic fruit
- Capsicum
- Salad greens
- Seedlings
- Strawberries
- Tomatoes
- Various

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