Tasmanian Institute of Agriculture

UNIVERSITY of TASMANIA

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TIA is a joint venture of the University of Tasmania and the Tasmanian Government

From trash to treasure: can sea urchin waste be beneficial for crops?

utas.edu.au/tia

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Background

The longspined sea urchin, *Centrostephanus rodgersii*, is a major threat to Tasmania's kelp forests and marine biodiversity. Urchins graze extensively on kelp beds producing lifeless barrens, displacing ~150 other marine species, such as black-lipped abalone.

Warming ocean currents have facilitated the migration of urchins from mainland Australia down to the east coast of Tasmania. Scientists from the Institute of Marine and Antarctic Science (IMAS) estimate there are now ~20 million long-spined sea urchins off the coast of Tasmania, a 75% population increase from 2002 to 2017.

Control measures

Urchin harvesting is currently the most significant control measure being invested in. In 2016, the Tasmanian Abalone Council introduced a harvest subsidy to help reduce urchin numbers in Tasmanian waters. This initiative has seen the expansion of urchin processing facilities in Tasmania to remove and package the delicate roe for high end restaurants and export markets.

Over the last three years, 700 tonnes of urchin have been harvested. Of this, approximately 500 t is waste, which is currently directed to landfill - but is this waste, or is it simply a product that we haven't found a use for yet? TIA and IMAS researchers have joined forces to find out.

An FRDC funded project (2019-128) identified the potential of utilising urchin waste in the agricultural industry; an industry that is seeking organic and effective alternatives to synthetic inputs to boost crop productivity.

Further funding from the Tasmanian Government (NRET) and the MBCRC has facilitated an additional two years of research to investigate the impact of urchin waste as a soil amendment in long-term field trials.

KEY POINTS

- 20 million longspined sea urchins now exist off the east coast of Tasmania
- Longspined sea urchins destroy kelp forests and displace important marine species
- Population control is focused on urchin harvesting and selling premium roe
- Only 10 % of the sea urchin is edible, and the remaining 90 % is diverted to landfill at a substantial cost to industry
- TIA and IMAS researchers are investigating the utilisation of sea urchin waste as an organic soil amendment

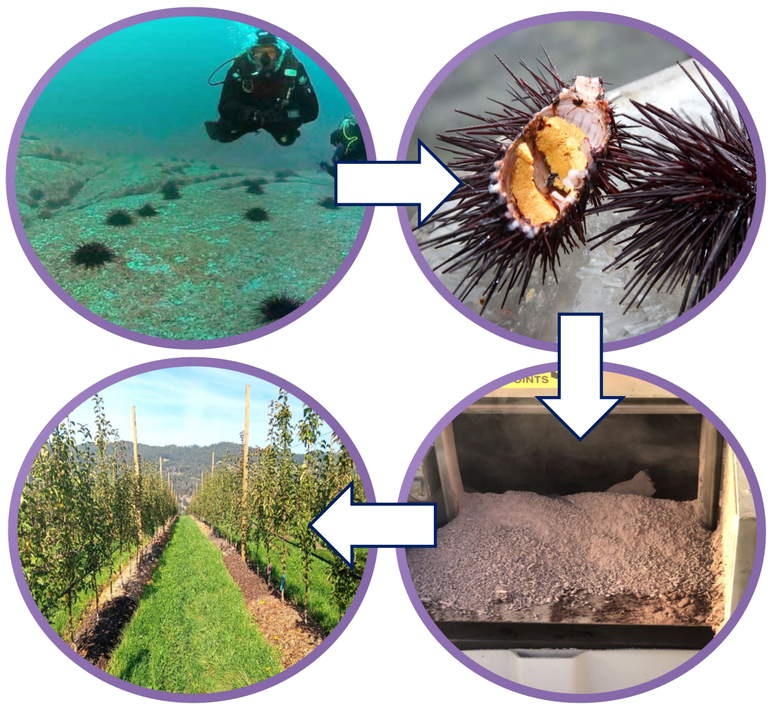

Fig 1. TL: *Longspined sea urchin barren on the East Coast of Tasmania,* ***TR:*** *harvested urchin with premium yellow roe,* ***BR:*** *processed urchin waste (shells, spines, gut contents),* ***BL:*** *urchin waste product spread on organic apple orchard.*

Urchin soil amendment

Agricultural potential?

Processed urchin waste (SUW) was found to be high in calcium (~33%); an important nutrient for deacidifying soils. In acidic soils, important nutrients become unavailable for plant uptake and other nutrients that can result in toxicity become more available. Soils naturally acidify over time and crop production speeds up this process, lowering soil pH. A consistent liming application of high calcium containing materials, such as limestone, are typically used to raise soil pH, yet these materials are sourced and produced under energy intensive processes. The ability to supplement or replace traditional liming materials with a calcium-rich waste material could be advantageous. Trials using SUW have found positive liming results (Fig 2).

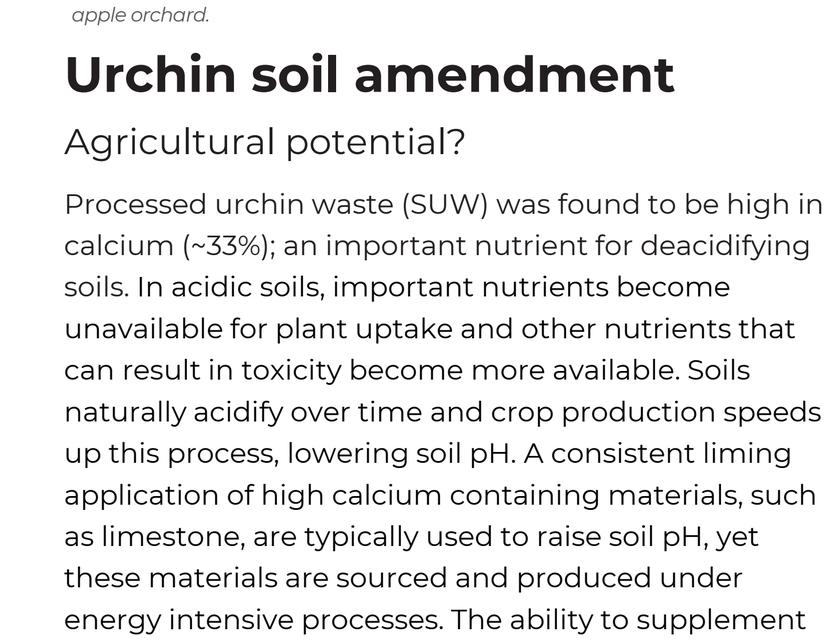

Fig 2. *Soil pH from September 2021 – August 2023 from a trial site at a Tasmanian vineyard amended with two sea urchin waste amendments (fine and coarse SUW), a commercial liming product (Ozcal) and a non-amended control*

SUW was also found to be relatively high in nitrogen compared to other marine agricultural products, and high in other important plant nutrients, such as Boron. Preliminary pot trials using dwarf sunflowers demonstrated that the nutrients from the SUW were taken up by plants and used for growth, where the higher the application rate was, the bigger the sunflowers became (Fig 3).

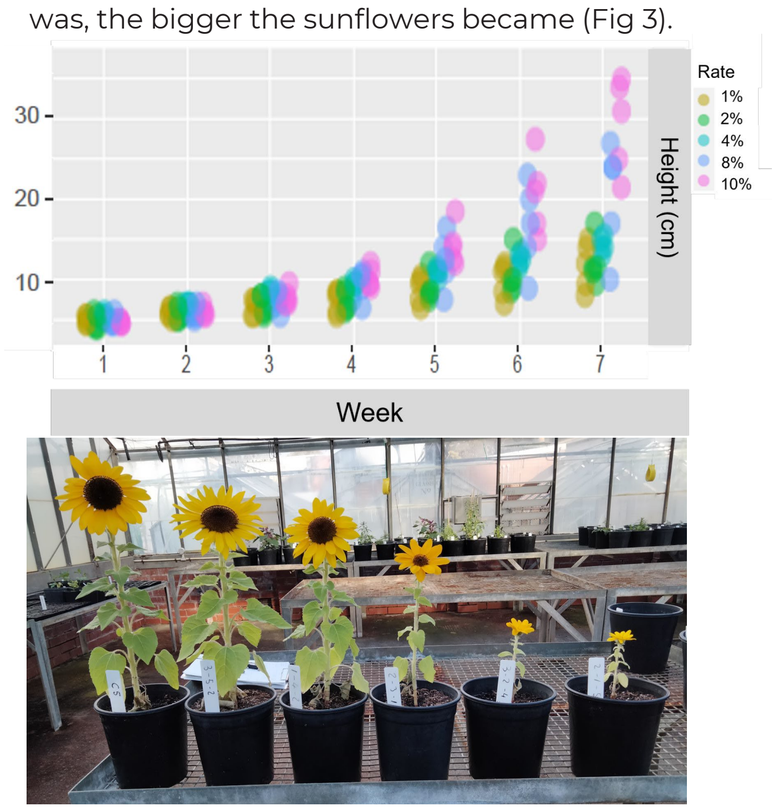

Fig 3. ***Top:*** *Height of dwarf sunflowers amended with different SUW rates (1 – 10 %) over 7 weeks;* ***Bottom:*** *sunflowers arranged by biggest (left) to smallest (right) SUW application rate*

Highlights

Processed urchin waste (SUW) was found to be high in calcium (~33%), relatively high in nitrogen, and high in other important plant nutrients, such as Boron.

SUW has been applied in field trials at a vineyard, an organic apple orchard, and on a rotational vegetable research farm.

The impact of the SUW on different crops on a variety of soil types will be explored in field trials until the end of 2025 to obtain long-term data.

This project is highly aligned to circular economy principles and blue/green economies.

Blue economy impacts: increasing industry profitability and further encouraging urchin harvest as a means of population control to reduce urchin destruction of marine habitats

Green economy impacts: using SUW as a replacement or complementary product to reduce synthetic fertiliser use and the mining of natural resources (e.g. limestone). It may also minimise land degradation through soil amelioration.

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Abalone Industry Reinvestment Fund