

South Australia takes the lead in land-based macroalgal production

SARDI researchers aim to tap into an \$8.2 billion international market by developing land-based macroalgal production in South Australia.

Sought for a variety of uses including human, livestock and abalone food, nutraceuticals, cosmeceuticals and pharmaceuticals, global demand for macroalgae exceeds 14 million tonnes annually.

With ideal growing conditions and hosting one of the most diverse marine flora in the world, South Australia is positioned to lead Australia in land-based culture of macroalgae. Such developments have the potential to provide opportunities for employment and economic activity in regional areas.

Macroalgae has been farmed offshore in Asia and South America for many years, with South Africa the only country so far to develop commercial land-based production systems. Production in Australia is limited, with the few South Australian companies entirely reliant on the collection of macroalgae cast as drift on beaches, providing product of variable quality and quantity and little opportunity to increase production due to environmental issues.

Australia currently imports over 5,000 tonnes of macroalgae annually, valued at more than \$14 million, largely to meet the demands of chefs in high end restaurants and bioactive industries. Farming macroalgae provides a more sustainable alternative with considerable potential in Australia for domestic and export markets.



Steven Clarke (left) and Dr Sasi Nayar with cultured *Ulva* spp. at the South Australian Research and Development Institute.

In a recently approved project 'Development of a Sustainable South Australian Macroalgal Aquaculture Industry', the South Australian Research and Development Institute (SARDI), in collaboration with research and industry partners, aim to establish South Australia as the lead state in land-based macroalgal farming and associated research and development. Focusing on demonstrating cost-effective mass culture of three marine macroalgal species known for their life history characteristics, culture methods and market potential, researchers are looking to build

upon "farm to market" value chains.

Known as excellent abalone feed, *Gracilaria* spp. and *Ulva* spp. are also used in a range of delicacies. Additionally, *Ulva* spp. and *Cladosiphon* spp. are candidate species for development of bioactive chemicals used for anti-tumor, anti-bacterial, anti-viral, gut health and anti-inflammatory conditions. *Gracilaria* is also an excellent source of hydrocolloid agar with various applications, including gelling agents in foods and cosmetics. These diverse products demonstrate the potential scope offered by farming macroalgae.

Proof of concept trials will optimise the culture protocols for these species by identifying environmental thresholds and conditions that maximise growth, as well as develop and trial a number of land-based production systems, which may include raceway and spray cultivation as well as hybrid abalone – macroalgae culture systems.

One of the main benefits of macroalgae production, which will be undertaken at SARDI and on commercial sites, is the utilisation of nitrogen rich waste water from industry partners to maximise macroalgal production, reduce operating costs and demonstrate nitrogen sequestration potential. With elevated nitrogen levels known to increase chlorophyll, nitrogen and protein in macroalgae, waste water from industries such as soda producers and onshore saline aquaculture ventures is ideal for farming. The high quality end product can potentially have many benefits such as improving the colouration and immune response of abalone, as well as reducing nutrient discharges to the marine environment, thereby capitalising and building on Australia's clean and green image. Waste water feasibility trials within this project will identify suitable industries for co-production, providing the dual benefit of reducing an industry's environmental footprint while producing a highly profitable product.

The macroalgae produced will provide industry partners with the opportunity to evaluate its quality and marketability.

Bio-economic modelling developed by the project will summarise the costs and benefits of the technical research outcomes and provide guidance to industry on the commercial feasibility. Discussion papers will also be developed to assist an appropriate government policy and regulatory framework.

Overall, the project will provide the basis for industry partners and others to invest in sustainability macroalgal aquaculture in South Australia, with potential economic and regional employment benefits for regional communities.

Key Points

SARDI, in collaboration with research and industry partners, aims to establish South Australia as the lead state in land-based macroalgae farming.

Proof of concept trials aim to optimise production and build upon "farm to market" value chains for *Gracilaria* spp., *Ulva* spp. and *Cladosiphon* spp.

Nitrogen sequestration potential will be demonstrated using waste water from existing industries, highlighting the benefits to macroalgal production as well as the opportunity to reduce the environmental footprint of industries.

Bio-economic modelling developed throughout the project will provide guidance for industry to make a decision on scaling up for commercialisation.

Results will provide the basis for a sustainable land-based macroalgal aquaculture industry in SA, with potential economic and employment benefits for regional communities.

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Acknowledgements

Abalone Investments Ltd
Adam & Amos Abalone Foods Pty Ltd
Coorong Aquaculture Pty Ltd
Flinders University of South Australia
Marinova Pty Ltd
Penrice Soda Products Pty Ltd
Science to Manage Uncertainty
South Australian Research and Development Institute
The University of Adelaide

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