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Qponics Update – 21 January 2020

A Future in Australia for Large-Scale Co-Production of Alternative Protein and Oil from Algae

Introduction

By 2050, the world's population is expected to reach 9.8 billion, consuming 50% more protein than is available now[i]. Insufficient grazing and arable agricultural land currently exist to meet current and future global demand for protein produced from livestock and crops[i]. Climate change impacts on agriculture are predicted to exacerbate the looming global protein deficit[i].

Global per capital demand for meat grew from 24.6kg in 1966 to 36.4kg in 1999 and is projected to grow to 45.3kg by 2030[ii]. Livestock currently contribute 14.5% of all anthropogenic greenhouse gas emissions, with cattle and pigs responsible for 9.4% and 1.3% of these, respectively[iii].

About 3.2 billion people rely on seafood as a source of protein, but oceans are warming, causing decline and relocation of marine animal populations[iv]. Therefore, future demands for protein and omega-3 fatty acids are unlikely to be met from the oceans.

Producing 1 kg of protein from beef, pork and poultry requires 32x, 9x and 3x more area of land respectively, than producing 1 kg of protein from soybeans[v]. Producing 1 kg of beef, pork and poultry requires 14x, 8x and 4x more water respectively, than producing 1 kg of protein from soybeans[vi] [vii] and 83% of the world's farmland is used for animal agriculture, using about 1/3 of the world's water consumption[viii]. This suggests that increasing production of protein-rich broadacre crops such as soybeans may significantly contribute to meeting the future protein gap, but projected trends for annual growth in yield are less than half what is needed[ix].

Alternative protein ingredients sourced from soybeans as well as pulses such as chickpeas are increasingly used as ingredients in vegetarian meat-like, pork-like, chicken-like and fish-like foods. But in 2017-18, 97% of the 337 million tonnes[x] of global soybean meal production was used for livestock and poultry feed, with only 3% available for human consumption as soymilk, tofu and alternative protein. Reallocation of soybean meal from animal feed to alternative protein for human consumption would jeopardize the livestock and poultry industries, thus is not a realistic solution. Increasing global soybean production to close the future protein gap is also likely to be hampered by reduced rainfall, disrupted irrigation rights and more frequent droughts in agricultural regions together with insufficient arable land for the purpose.

Alternative meat protein products are projected to be 10% of the US$1.2 trillion global meat market by 2025, rising to 60% of the US$1.8 trillion meat market by 2040, and similar growth for alternative proteins may also occur for the US$160 billion seafood market [ii].

However, without transformative changes in agriculture to increase supply of alternative protein, an uncontrollable global protein deficiency may be inevitable.

An example of transformative change in agriculture to produce alternative protein without the need for fertile land, rainfall or irrigation has been demonstrated by Qponics. The Company cultivates a marine species of microalgae to co-produce high-value oil rich in fatty acids, antioxidants and vitamins to ensure farm viability, together with a low-value protein-rich by-product suitable for use as an alternative protein food ingredient.

Qponics' model for sustainable and droughtproof protein production

Qponics has developed a scalable, modular and automated outdoor raceway pond model for farming marine microalgae on the banks of tidal rivers in coastal central eastern Australia, a region which offers the ideal climate and affordable, near-urban land suitable for algae farming. Qponics' farm operation requires a source of salty tidal river water and not freshwater to operate, therefore it is a droughtproof farming process.

The Company recently upgraded an existing R&D-scale pilot marine microalgae farm on University of Queensland land on the bank of the Brisbane River, funded in part by its $1million Cooperative Research Centres Project grant, to successfully demonstrate its droughtproof farming model.

Qponics' strategy is to apply a co-production process: a fast-growing Australian marine microalgae species within the genus *Nannochloropsis* is cultivated, from which is extracted (1) a high-value algal oil primary product rich in the fatty acids eicosapentaenoic acid (EPA) and palmitoleic omega-7 (current global wholesale price: about US$200/kg), and (2) a low-value by-product, rich in protein with a full complement of essential amino acids, that is suitable as an alternative protein food ingredient (predicted to wholesale at up to US$5/kg).

Producing 1 kg of protein from beef, pork, poultry and soybeans requires 960x, 270x, 90x and 30x more area of land respectively, than producing 1 kg of alternative protein from Qponics' marine microalgae[xi].

Algae cultivated in Qponics' large outdoor raceway ponds require plentiful average daily hours of sunlight, minimal added nutrients and 2 kg of carbon dioxide is sequestered for every kg of algae produced to rapidly grow by photosynthesis, and ponds are harvested every three days. Qponics plans in the future to capture and store atmospheric carbon dioxide to feed to the algae to become a negative carbon emissions company.

Profitability of Qponics' marine microalgae farm is planned to be assured from sales of high-value algal oil; therefore, the protein-rich by-product may be wholesaled at prices competitive with all other sources of protein, and protein productivity cannot be affected by the worst of drought conditions.

Subject to capital, Qponics plans to prepare and submit a development application to Ballina Shire Council at the earliest opportunity, to allow construction of the first stages of the marine microalgae farm including 10.8 hectares of production ponds to commence by mid to late 2020 on a selected property in South Ballina. It is anticipated that in the future up to 150 hectares of production ponds may be operational on this site.

Productivity per hectare of production ponds per year is calculated to be about 20,000 kg for algal oil and about 46,000 kg for the by-product which is 72.5% protein, based on actual data from the Brisbane marine microalgae farm upgraded by Qponics in 2018-19.

Future potential marine microalgae farming in the Northern Rivers region

Adjacent to the banks of the Richmond River in the South Ballina region there are approximately 10,000 hectares of agricultural zoned land suitable for marine microalgae farming. Consequently, it is foreseeable that this region has the potential to become a major hub for outdoor raceway marine microalgae farming in Australia employing thousands of people.

The region has the potential to produce about 320,000 tonnes of alternative protein per year for use as a human food ingredient, unaffected by the effects of extreme drought conditions and planned to be profitable through sales of high-value products derived from oil extracted from a wide range of different Australian marine microalgae species.

Dr Graeme Barnett,
Chief Executive Officer and Managing Director

[i] https://wrr-food.wri.org/sites/default/files/2019-07/WRR_Food_Full_Report_0.pdf
[ii] The Investment Case for Alternative Protein. AgFunder Report, November 2019.
[iii] http://www.fao.org/news/story/en/item/197623/icode/
[iv] https://www.sciencenews.org/article/oceans-are-warming-due-climate-change-yield-fewer-fish
[v] https://www.truthordrought.com/soybean-myths
[vi] https://www.sciencedirect.com/science/article/pii/S2212371713000024
[vii] https://www.sciencedirect.com/science/article/pii/S2212371716301573
[viii] https://agfunder.com/invest/protein-fund/
[ix] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3686737/
[x] https://en.wikipedia.org/wiki/Soybean
[xi] Qponics' protein productivity data plus reference v above