Ireland's contribution to the European Bioeconomy

The potential contribution of marine derived bioresouces

Marine derived biomass has the potential to contribute to the European Bioeconomy through conversion into food, animal feed and related biobased products. In addition there are many examples of the successful use of marine origin materials and compounds in pharmaceuticals, novel industrial enzymes, food and food ingredients, biosensors, drug delivery systems and as new chemical compounds. This is highlighted in Europe's Blue Growth Strategy, which describes 'opportunities for marine and maritime sustainable growth' was published in 2012[1]. Blue Biotechnology/Marine Biotechnology is embedded in the overarching 'Bioeconomy Strategy for Europe' adopted by the EC and also within national policy through *Harnessing Our Ocean Wealth* [2].

Ireland, through the Marine Institute, led the development of the European Marine Biotechnology Research and Innovation Roadmap[3]. This report described research and market opportunities in areas ranging from exploring the marine environment; biomass production and processing; product innovation and differentiation; the development of enabling tools, technologies and infrastructure, and providing knowledge to support policy development. The report of the Marine Biotechnology Taskforce[1], commissioned by the Marine Institute in 2016, encouraged research and market effort to be directed towards "low-hanging fruit" to secure early successes that will contribute to Ireland's ability to be globally competitive in food, health and biomaterials-related business activity.

Potential markets for marine bioresources

The global market for marine biotechnology enabled products has the potential to reach $4.8 billion by 2020, rising to $6.4 billion by 2025[4]. The nutraceuticals market, an area targeted as a priority research theme in Ireland, is expected to reach $250 billion by 2018[5]. With products based on marine biological resources, principally – algae and fish, the market for Omega-3 polyunsaturated fatty acids, is expected to grow at nearly 14 percent per annum to reach close to sales of $19 billion by 2020[6]. Marine products already account for nearly one third of the global nutraceuticals market. Emerging applications for marine based products in several new end-use areas including bioprocessing, environmental remediation and monitoring, cosmetics, and agriculture: whilst the projected global population growth is likely to fuel demand for marine proteins.

Marine biomass contributing to economic growth

New value-chains from marine bioresources as high-potential contributors to European consumer health and food security, and enabling future opportunities for both food and non-food products based on marine biomass have been identified[7]. This has been recognized by Europe's Bio-based Industries Joint Undertaking (BBI-JU) [8], which has highlighted the potential impact on economic growth and new jobs in rural and coastal areas; and in creating new revenue streams for the EU's agri-food and marine sectors.

Ireland's research capability in this area

Ireland has an established marine biotechnology research community that have been enabled by funds secured from competitive funding initiatives, both national and international. Irish researchers are active in areas related to the use of marine biomass for biomaterials, food and food ingredients - including functional foods, drugs and therapeutic products, animal health and agriculture, aquaculture, medical devices, cosmetics and environmental remediation.

Research capacity and competencies were built on the seed funding of €12.5 million provided by the Marine Institute and the Department of Agriculture Food and the Marine in 2008, to initiate the NutraMara and Beaufort Biodiscovery projects. The seven Principal Investigators involved in these projects have secured additional research funds of €60 million over the past eight years, including funds from the DAFM FIRM Programme, Science Foundation Ireland, Environmental Protection

[1] Available on request from the Marine Institute

Agency, the Irish Research Council, Enterprise Ireland and the EU. Together, these leading PIs have also delivered close to 1,000 peer-reviewed publications, supervised the completion of over 100 PhDs and have created strong national and international industry links. As a result, Irish researchers now participate extensively in national and international collaborative research projects and have formed strong links with industry based on their individual expertise in phycology, microbiology, natural products chemistry, protein chemistry, human and animal health, food and agriculture.

A developing marine biomass bioprocessing sector

Ireland has a long history in the harvesting, processing and use of marine biomass. Several companies specialise in supplying materials extracted from marine algae, and some produce seaweed based feed, food, cosmetic and agricultural fertilisers. An example of recent developments in this sector include an Irish company which has recently commissioned Ireland's first dedicated marine biomass bioprocessing facility; capable of converting fish discards, underutilised whole fish and other marine species into valuable materials. This multi-stream bioprocessing plant simultaneously extracts proteins, minerals and lipids from materials which are considered low-value.

1 http://ec.europa.eu/maritimeaffairs/policy/blue_growth/
2. https://www.ouroceanwealth.ie/
3. http://www.marinebiotech.eu/launch-marine-biotechnology-research-and-innovation-roadmap
4.Smithers Group (2015) The Future of Marine Biotechnology for Industrial Applications to 2025. Available at http://www.smitheersrapra.com/products/market-reports/biomaterials/the-future-of-marine-biotechnology-for-industrial
5. KPMG International (2015) Nutraceuticals: The future of intelligent food- Where food and pharmaceuticals converge. Available at https://www.kpmg.com/ID/en/industry/CM/Documents/neutraceuticals-the-future-of-intelligent-food.pdf
6. Marketsandmarkets.com(2015) Omega-3 PUFA Market by Type (DHA, EPA, ALA), Application (Dietary Supplements, Functional Foods & Beverages, Pharmaceuticals, Infant Formula), Source (Marine, Plant), Sub-source), & Region-Global Forecasts to 2020. Available at http://www.marketsandmarkets.com/Market-Reports/omega-3-omega-6-227.html Accessed 4th March 2016.
7. Food 2030 workshop
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8. https://www.bbi-europe.eu/sites/default/files/bbi-ju-2016-call-for-proposals-brochure.pdf