Profiling and Analysis of a Novel Peatland-Based Bioeconomy Demonstration Model Farm

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

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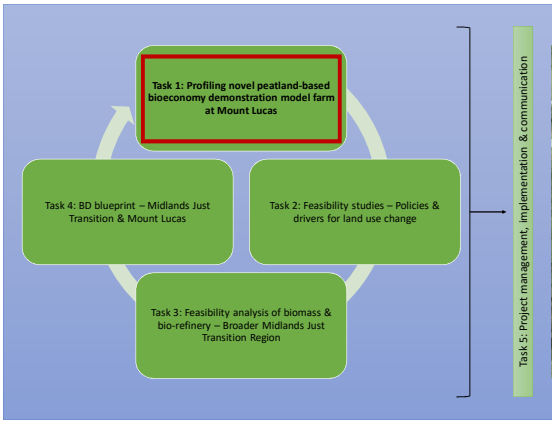
Introduction

This two year project constitutes the first study to consider development of environmental bioeconomy demonstration as a blueprint initiative in order to inform key top down strategic policies using a bottom up user approach. Moreover, there is a strong emphasis on supporting and enabling appropriate real-time decision-making at this interface where innovations can be assessed from discovery to commercial phase (TRLs). This addresses broad stakeholder engagements including public-private-partnerships and exploits the Quintuple Helix framework (academia-industry-government-environment-society) for evaluating, assessing, modelling and informing effectiveness. This initiative also addresses local government and communities to support fair and just transition to low carbon economies along with accelerating green-tech innovation using digital technologies. The outcomes of this novel project will inform pipeline of next generation of skilled researchers, entrepreneurs and educators. It will also address risk mitigation and technology disruption using established and emerging sustainable tools. Given its complexity with a solutions-focus, emphasis will be placed on open knowledge exchange for stakeholders so as to educate communities and to accelerate appropriate behavioural change for the betterment of society. This timely research aligns with Midlands Regional Development Plan 2024 and is supported by DAFM.

The first peatlands based freshwater aquaculture recirculation system powered by wind turbines has been established at a 5.2 ha. organic site in the Irish midlands. This unique system uses natural microalgae, bacteria and duckweed to remediate waste and to address water quality without discharge to receiving water. It does not use artificial chemical, antibiotics or pesticides. The model farm provides an example of highly novel land-use change from cut-away bog to inland aquaculture. The re-wetted site will soon be fully active and accessible to researchers and visitors. Unique to Europe, the farm models a circular biomass production system whereby cultivated fish waste products are utilised as a direct nutrient source for a high value protein rich aquatic plant crop (Duckweed).

Task 1 is focused on profiling the model farm, reviewing research already conducted on the novel site and highlighting the next stages of research required in order to further develop the system. This will allow for the development of effective and reliable circularity operations. This in turn will subsequently allow for identification of gaps in policies with potential solutions offered.

Task Overview



Task 1 Objectives

- **Review all data from previous linked projects in order to identify best evidence-based processes and policies that informs optimal circularity.**
- Analysis of novel farm as an example of a highly novel land-use change from cut-away bog to inland aquaculture.
- Review of on-site data, focusing on the carbon cycle facilitated by diverse microalgae that sequester CO_2 in the ponds.
- Elucidate the role of duckweed that can be transformed by bio-refining to multiple products suitable as aquaculture feed ingredients replacing less sustainable fishmeal & imported products, closing the nutrient cycle for the farm.
- Analysis of existing & optimal conditions for supporting biomass production & bio-refining duckweed, microalgae, *etc.* at the novel site that includes production of high value extracts & other bio-actives for potential food / feed use.

Work to Date

Original Research

- Physicochemical, algal, bacterial / cyanobacterial & duckweed analysis
- Molecular analysis identifying biological complexity of system
- Analysis of nutrient removal
- Analysis of weather variances

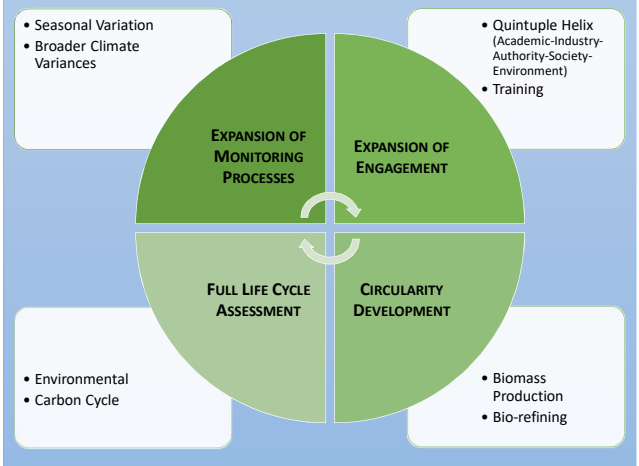
Reviews

- Challenges, opportunities and potential solutions for intensive sustaining of agri-food supply chain
- Use of smart technologies to address efficacy of peatland-based products and services to aid in Just Transition
- Triple helix approach to aid in addressing climate change & environmental degradation
- Use of site with digital transformation to support aquaculture expansion & meet UNSDG's

Linked Policies

- National Biodiversity Action Plan 2023-2030
- Climate Action Plan 2024 (CAP24)
- National Bioeconomy Action Plan 2023-2025
- Peatlands & Climate Action Plan 2030
- EU Biodiversity Strategy for 2030
- Natura 2000 Network - EU Birds & Habitats Directives
- EU Common Agricultural Policy (CAP)
- European Green Deal
- EU Water Framework Directive
- United Nations Sustainable Development Goals

Next Stage of Review



BioMDJT Project Partners

TUS Midlands Midwest
UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh
Teagasc Agriculture and Food Development Authority
Department of Agriculture, Food and the Marine, An Roinn Talmhaíochta, Bia agus Mara
Maynooth University National University of Ireland Maynooth
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