MOREFISH…
and how to get them...

While there are a multiplicity of factors contributing to the decline of Irish aquaculture production[1], some of the key challenges facing the sector include (i) increased production & operational costs, (ii) the cost of meeting ever-increasing environmental compliance & regulatory requirements, (iii) under-investment within the sector. It was against this backdrop of sharp decline in the freshwater sector that the Department of Agriculture, Food & the Marine (DAFM) elected to back a programme of research to identify the necessary scientific and technological supports to assist the sector meet and exceed growth targets. Out of this, the MOREFISH programme was developed.

MOREFISH comprised a multidisciplinary team of engineering and scientific expertise from the National University of Ireland, Galway and Athlone Institutes of Technology, industry stakeholders, policy-makers and commercial operators to respond directly to critical technical and policy gaps identified by stakeholders and the 2014 DAFM research call.

The aim of the programme was to develop and test innovative technologies and novel production processes to significantly improve production output, operational efficiencies and management at inland aquaculture sites in Ireland. Achieving these goals is also necessary to reconcile the contrasting demands of the growing national aquaculture industry with meeting the goals of the Water Framework Directive[2]. MOREFISH ran from January 2015 to August 2017; the key outputs and developments are discussed below.

Typical pond layout at one of the sites surveyed by MOREFISH (pic. A. Tahar)

Key MOREFISH Outputs

Benchmarking freshwater aquaculture sector

The MOREFISH team completed extensive independent onsite farm monitoring at a level that had not been completed previously, representing 85.1% of the trout industry production and 36.6% of the freshwater industry output. The team also engaged with a novel pilot scale configuration (i.e. pill ponds) which is due to ramp up to large scale production volume in 2018, with a view to establishing a new high value export sector for the freshwater industry in Ireland.

Research and development of methods suitable to assess the sustainability of the sector were investigated. These methods included the use of life cycle assessment to incorporate biodiversity impacts and a sustainability indicator 'toolkit' to enable farms to effectively monitor the impact of interventions and process changes on the operation of the site. From the benchmarking of the sector, recommendations were provided to the industry stakeholders in terms of energy potential savings and farm operation. In terms of academic output, the MOREFISH platform provided specialist training and expertise to high calibre early-phase researchers that will act as a conduit for transferring beyond-state-of-the-art knowledge on processes and innovation to industry, which will help with intensive sustainability

One of the novel aeration units trialled at one of the farms (pic. A. Tahar)

of Irish aquaculture. The team was also successful in acting as a scientific and technological hub for networking stakeholders in freshwater aquaculture.

Technology Development

One of the areas of the MOREFISH platform was the development and optimization of technology to address challenges encountered in the freshwater aquaculture sector (i.e. aeration/oxygenation and disinfection). Extensive aeration and oxygenation studies, utilising microbubble technologies were conducted and benchmarked against industry benchmark technologies (e.g. paddle aeration systems and diffused aeration systems). A novel pulsed ultraviolet light (PUV) disinfection technology, was also developed and analysed for its efficacy in removing pathogens identified as the main causes of disease and mortalities within the freshwater aquaculture sector.

Industry Engagement and Dissemination

A core ethos of MOREFISH was extensive engagement with industry. This was carried out through the organization of 3 industry meetings that gathered together all freshwater aquaculture stakeholders in Ireland for the first time. The MOREFISH project received support from industry, representative bodies and other public bodies for the continuation of this forum, with the next meeting expected to be held in early 2018.

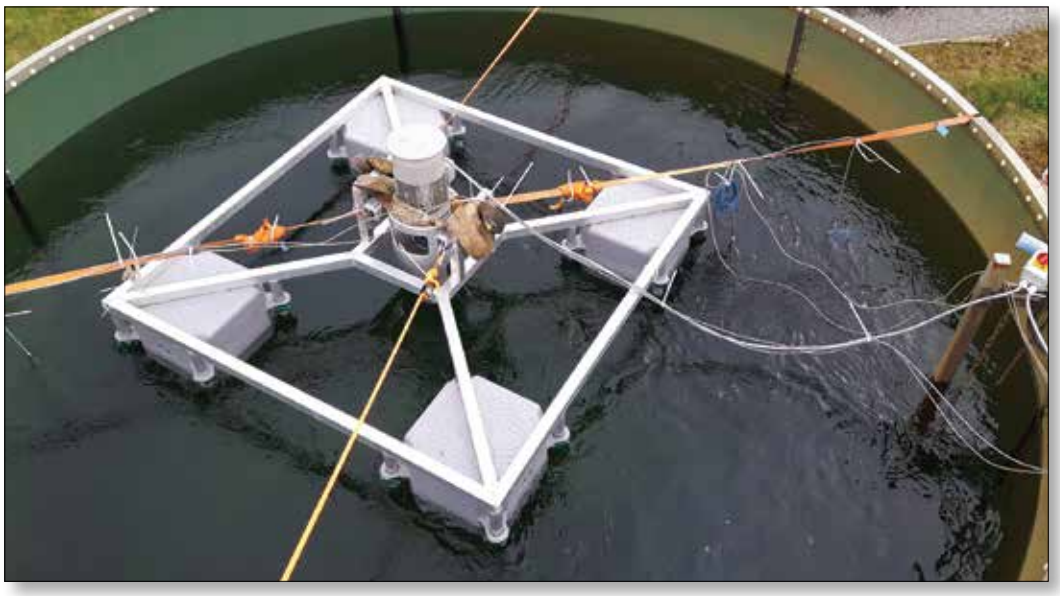
Key dissemination outputs from MOREFISH included presentations given at both national and international peer reviewed conferences, strong online and social media presence (via www.morefish.ie), participation in different international aquaculture training events on recirculating aquaculture systems and life cycle assessment and the presence of international experts at MOREFISH events. The team also collaborated (and continue to collaborate) with a variety of European partners through these workshops and projects emanating from MOREFISH. Local authorities were also represented at the MOREFISH industry meetings culminating in ongoing proactive engagement with the City and County Management Association (CCMA).

Feedback during these workshops resulted in the team carrying out an extensive review of trade effluent licences. This review aimed to identify and advance the understanding of the challenges facing both industry and regulatory authorities in the interpretation of the WFD and its potential impact on the future of the industry.

Key Recommendations

The main recommendations from the MOREFISH programme include:

(i) There needs to be ongoing support for the development and application of new technologies to assist the Irish freshwater aquaculture industry meet the targets set out under Food Wise 2025.



A new design of surface aerator being trialled (R. Cooney)

The novel pill-pond farm layout (R. Cooney)

(ii) Increased engagement by Irish industry and stakeholders with leading EU academic research institutions is necessary to help fulfil the potential of the sector. Collaboration with industry stakeholders is key to demonstrating and validating technologies and processes at higher technology readiness levels.

(iii) To facilitate and prepare commercial stakeholders for future diversification into alternative practices including recirculation aquaculture system (RAS) based on international-best practice.

(iv) Ongoing engagement with local authorities to explore avenues to proactively address the challenges faced by all parties in implementation of the Water Framework Directive. The development of a risk-based approach in applying the WFD could be supported by environmental models (such as in www.catchments.ie) for predictive assessment and decision-making.

(v) The tools developed by the MOREFISH programme (e.g. sustainability indicators, LCA) can be used to help optimise the sustainable growth of the sector while also demonstrating its potential as a low carbon food production industry.

(vi) Such tools could also underpin third party certification (e.g. Aquaculture Stewardship Council or Global Salmon Initiative) and increase consumer confidence in Irish aquaculture.

(vii) The development of online and real-time monitoring systems for measuring water quality and analysing microbial and algal communities in freshwater aquaculture can lead to improved management of sites and enhanced ecosystem management.

(viii) Establish a demonstrator hub facility for pilot phase trialling of best available technologies in the form of the Danish 'Model trout farm' concept to define a strategic roadmap for the industry growth and development, to meet targets set out under Food Wise 2025.

A key success of the MOREFISH programme has been the formation of an independent platform which can act as a scientific repository for the industry, and provide a forum for the industry to establish proactive engagement among all stakeholders, thereby supporting the sustainable development of the industry.

EcoAqua

In late 2017, the MOREFISH team commenced a further 2-year project "EcoAqua". EcoAqua has received €348,781 in funding under the European Maritime Fisheries Fund (EMFF), administered by Bord Iascaigh Mhara, through the Knowledge Gateway Scheme, on behalf of the Department of Agriculture, Food and the Marine. The output of this project will include new process, operational and technological interventions, whilst also contributing to the knowledge base within the national aquaculture sector. It has built on capacity for, and developed new partnerships focused on, research and innovation in environment and health. The project aims to test and optimise innovative technologies and processes developed through the MOREFISH project. Key areas of research under EcoAqua include: water treatment technologies and their application to aquaculture, energy reduction interventions, LCA studies, facilitate water re-use and intensive continual monitoring of on site performance.

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[1] While European aquaculture has experienced stagnation over the past 20 years, the Irish sector has seen continued decline & shrinkage over the same period with total Irish aquaculture output declining from about 63,000 tonnes in 2002 to 40,000 tonnes in 2015. Over the period 2005 to 2015 both the trout and salmon smolt freshwater production has experienced considerable fluctuation, with the trout industry seeing a decline from a high of approx. 900 tonnes annual production in 2009 to a level of 705 tonnes annual output in 2015.

[2] This is also set against a background of meeting ambitious targets set by Food Wise 2025 that seeks to grown food exports by €19bn by 2025.