

Supporting the sustainable development of the Irish freshwater aquaculture industry

Irish freshwater aquaculture context

EcoAqua is a Bord Iascaigh Mhara (BIM) funded project (2017-2019). Irish freshwater aquaculture produces mostly salmonid species such as rainbow trout and salmon smolt in traditional flow through systems involving high water abstraction volumes, with limited water treatment and reuse on-site. The legislative framework concerning inland aquaculture is evolving via the water framework directive (WFD) through increasingly stringent discharge limits (e.g. ammonium, phosphorus) and existing, or potential limitations, on freshwater abstraction rates. Therefore, this industry has a need to enhance productivity in a sustainable way, as recommended by both Irish government (e.g. Harvest 2020 program ^[1]) and European Union policy^[2], while reducing the release of nutrients through the environment. Developing reuse or partial recirculation involving oxygenation and water treatment appears to be a potential solution to improve Irish aquaculture practices and to increase production in a sustainable way ^[3]. This project, as with the previous MOREFISH project (2015-2017 – DAFM funded), is a collaborative program between NUI Galway, Athlone Institute of Technology (AIT) and industry stakeholders (i.e. fish farms and industry/state bodies).

Objectives

- **BENCHMARKING OF THE INDUSTRY (1 YEAR MONITORING – 4 FISH FARMS)**
 - Evaluation of the environmental impact (nutrient fluxes Vs river assimilation capacity)
 - Identification of the biological dynamic in ponds (hydraulic, algae, bacteria, viruses)
- **FACILITATE REUSE OF TREATED WATER BY PROCESS AND FARM MANAGEMENT OPTIMIZATION**
 - Solid/liquid separation (drum filter Vs belt filter)
 - Nitrification (constructed wetlands, moving bed bioreactor)
 - Aeration/oxygenation
 - Sensors development, energy savings
- **FOSTER LINK BETWEEN INDUSTRY AND RESEARCH**
 - Industry workshops
 - Enhancement of Industry/research platform

Approach

- **MULTIDISCIPLINARY APPROACH (ENGINEERING, WATER TREATMENT, FISH BIOLOGY, MICROBIOLOGY, TOXICOLOGY)**
- **FULL MONITORING OF 4 DISTINCT FISH FARMS FOR 1 YEAR (INFLUENT/EFFLUENT, REARING WATER, RECEIVING WATER) USING BOTH REMOTE MONITORING AND WATER SAMPLING AND LIFE CYCLE ASSESSMENT APPROACH**
- **CONTINUOUS LINK WITH THE INDUSTRY**

Conclusion – take home message

- **EcoAqua project will undertake a multi-disciplinary approach (i.e. engineering, toxicology, water treatment, management) in order to support the development of the industry.**
- **Long term study on real-sites representative of the Irish freshwater aquaculture**
 - ➔ Impact on receiving waters will be assessed and the condition to increase production without hampering the environment will be identified
 - ➔ Good practices will be identified and transmitted to the whole Irish freshwater aquaculture industry to fulfil the objectives of increasing production while minimizing environmental impact

The industry stakeholders

The fish farms were chosen in order to be representative of the Irish freshwater fish farming industry and to illustrate its variety in terms of species reared (salmon smolt, rainbow trout and perch), systems (tank, pond, pill-pond) and geography (Figure 1, Figure 2, Figure 3)

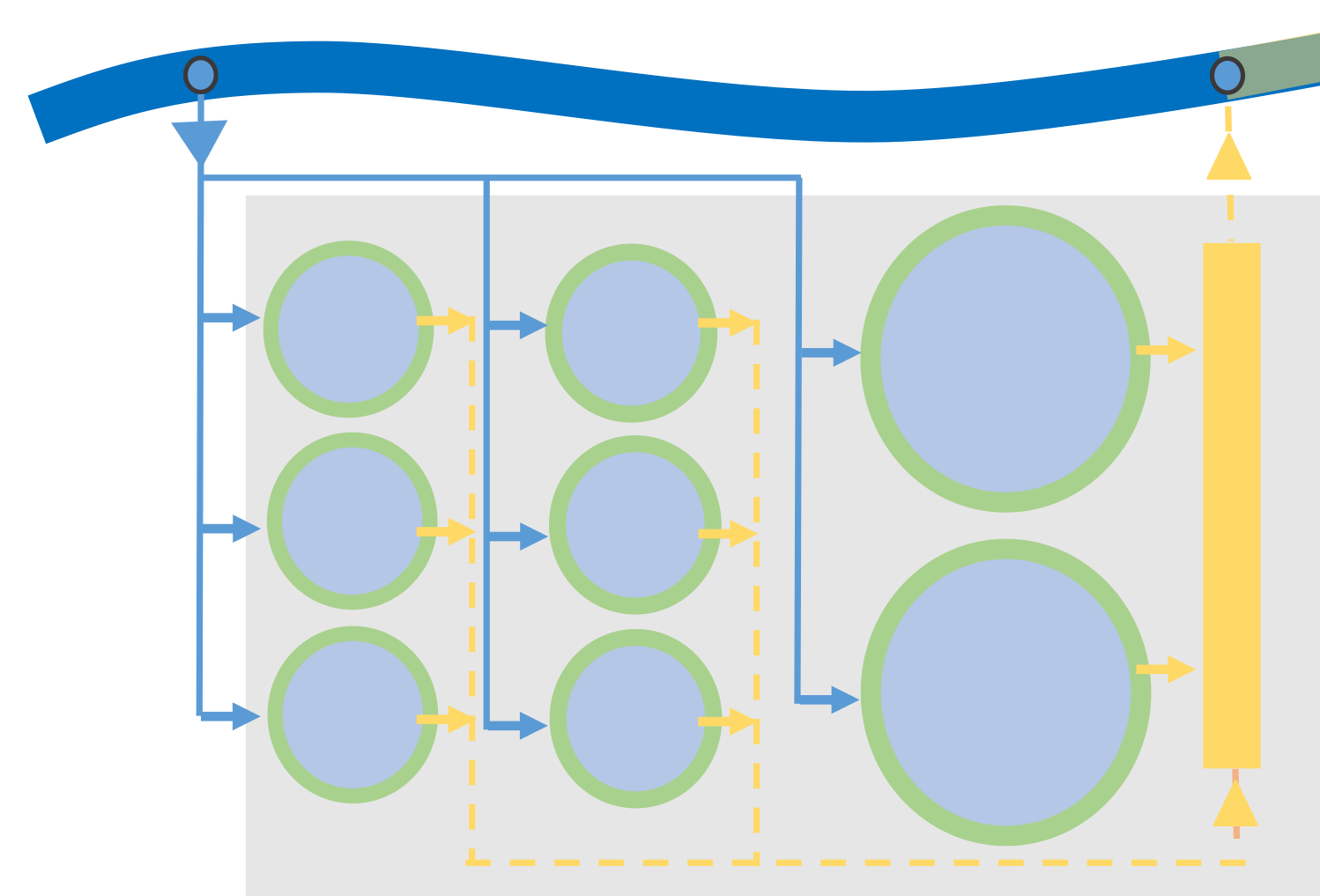


Figure 1: Tank based salmon smolt production unit involving solid removal before effluent release (left: schematic representation, right: picture)

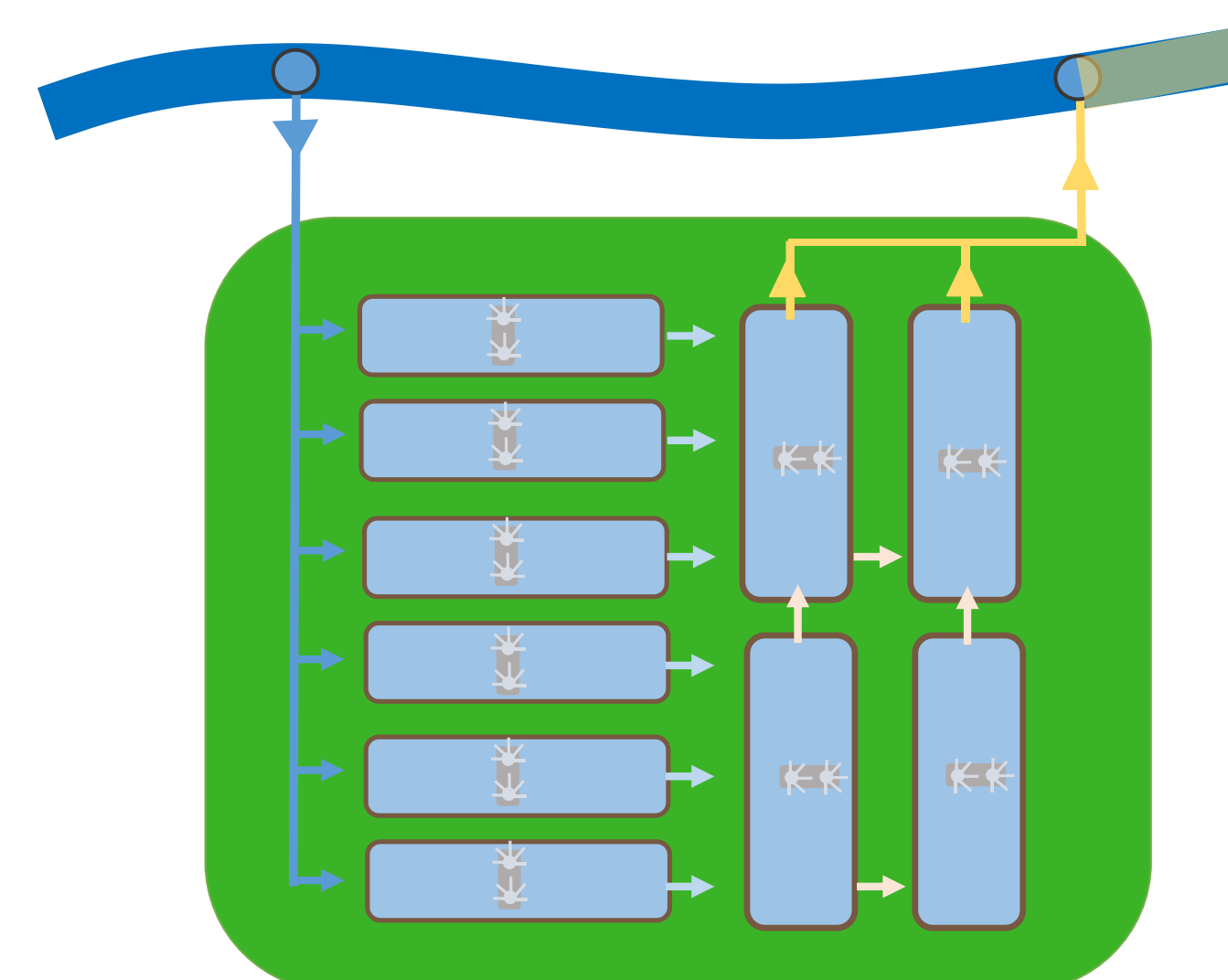


Figure 2: Pond based rainbow trout production unit with no water treatment involved (left: schematic representation, right: picture)

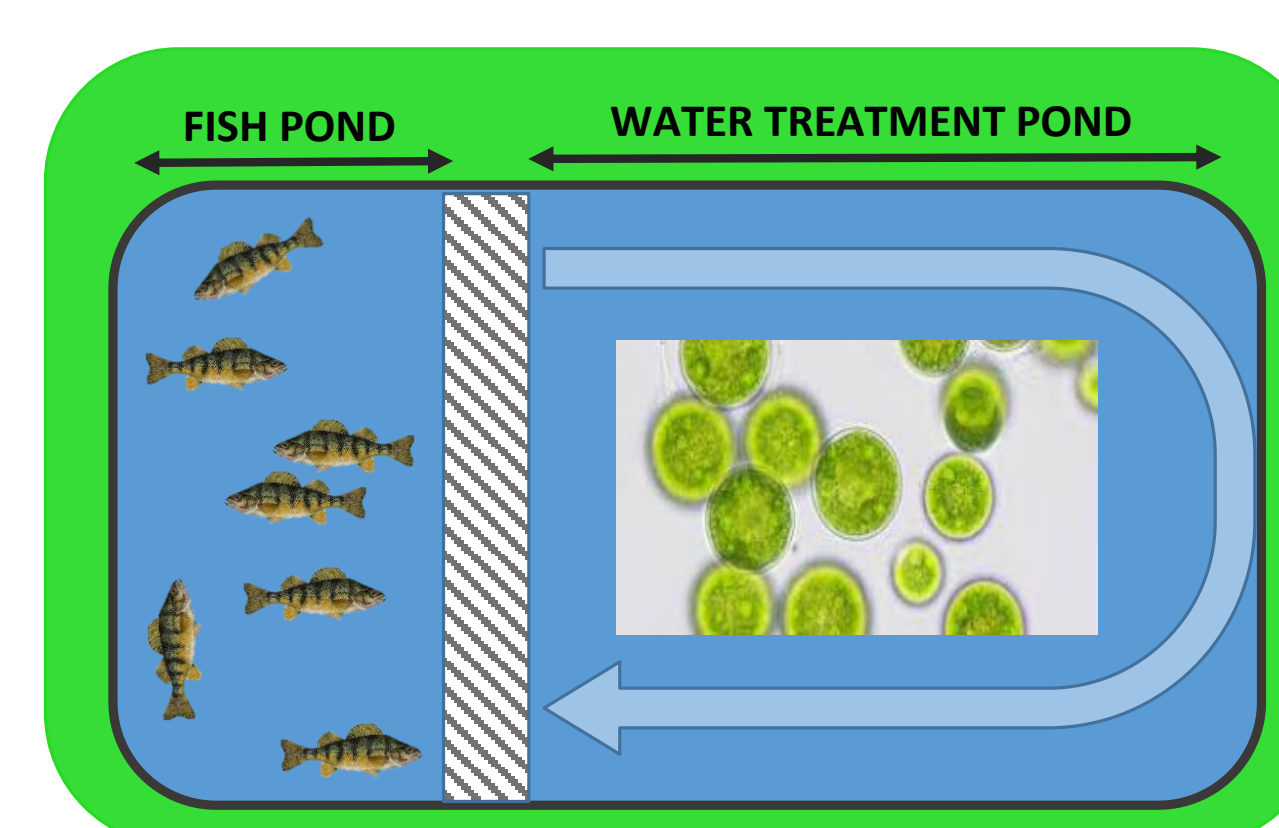


Figure 3: Pilot scale pill-pond based perch production unit involving in-pond recirculation and both water treatment and aeration by algae (left: schematic representation, right: picture)

Authors

A. Tahar, S. Naughton, O. Donohoe S. Kavanagh, N. Rowan
AIT - atahar@ait.ie
A. Kennedy, R. Cooney, C. Behan, R. Fitzgerald, E. Clifford
NUIG – michaelalan.kennedy@nuigalway.ie

References:

- ^[1] DAFM (Department for Agriculture, Food and the Marine), National strategic plan for sustainable aquaculture development (2015)
^[2] EU – COM Strategic guidelines for the sustainable development of EU aquaculture, 229 pp. (2013)
^[3] Warrer-Hansen Ivar, Potential for Land Based Salmon Grow-out in Recirculating Aquaculture Systems (RAS) in Ireland, A report to The Irish Salmon Growers' Association, IFA aquaculture (2015)