

BRAINWAVES

Agri Prospecting
Archwilio Amaethyddol
Taiscéalaíocht Talmhaíochta



Newsletter 3

May 2022

Welcome to our latest Newsletter!



Project Partners



Funded by the European Regional Development Fund through the Ireland Wales Cooperation Programme



Foreword

From Principal Investigator Professor Marcel Jansen

Duckweed ... on pizza!?

Duckweeds (Lemnaceae) are truly remarkable plants that match a record growth rate with very desirable properties, including a high content of good quality protein. As scientists, we have been working with these plants for several decades and made many fascinating discoveries. However, one of my more memorable discoveries was when I found 'punnets' of duckweed in a supermarket in Israel in the 1990s.



Israeli scientists and companies have long been at the forefront of duckweed applications and have developed a method to grow large amounts of clean, nutritious *Lemna gibba*. This particular duckweed species has particularly large air pockets in its fronds (leaves), giving it a nice, bubbly sensation in the mouth. I used to sprinkle the plants as a healthy addition onto pizza, or alternatively used them as a ready-cut salad. If you're interested in all the different ways duckweed can be used in the kitchen, there's a fascinating little booklet with delicious [duckweed recipes](#) by Hans Derksen, Cees Gauw and Yvonne Derksen. Quiche, spring rolls, curry - it's all there!

Left: Prof Marcel Jansen samples duckweed biscuits

Just a disclaimer, and a safety warning: Don't collect wild grown duckweed unless you know that it is clean, and hasn't absorbed pollutants present in the environment.

So, if duckweed is so wonderful, why does your local supermarket not stock it? The answer is that it depends on where you are from. Supermarkets in South East Asia, Israel and the USA do indeed stock duckweed for human consumption. However, in the EU the [Novel Food Regulation](#) constitutes a hurdle, applying to any food not produced or used before 1997 in EU member countries. However, multiple applications to recognise duckweed as a novel food in the EU are currently at an advanced stage, so keep an eye on your supermarket shelves for the arrival of a nutritious, protein-rich, sustainable salad!

World Water Day 2022



To coincide with [World Water Day](#) on March 22nd we launched a video with a behind the scenes look at the water remediation systems we have been developing over the course of the project. Watch it [here](#).

Read full press release [here](#).

Below: Video production in the Cooperage Building at UCC



Interested in this exciting work? Please visit our [website](#), follow us on [Twitter](#), or contact Project Manager Anna Power: anna.power@ucc.ie

Indoor Systems



Above, left and below: Project Steering Committee member Dr. SM Ashekuzzaman speaks with researchers on a recent visit to the indoor systems at UCC



The UCC team have recently been testing the capacity of three 500-litre re-circulatory systems to support duckweed growth and water remediation. The advanced replicated testing aims to address existing knowledge gaps, and includes exploring different LED lighting regimes to promote growth and reduce energy costs, and the assessment of robotic duckweed harvesting technology. The results of testing within previous smaller scale (125-litre) systems have been published in a leading industry journal. The peer reviewed paper is available [here](#). These data show, for the first time, how both flow rates and medium depths can affect duckweed removal of excess nutrients, as well as corresponding plant growth rates.

To date, other research has relied on static or extremely low-flow systems. What's more, the majority of existing studies have only extracted data from very small-scale systems (less than 15-litres) and have never demonstrated how altered flow velocities impact duckweed performance.



This lack of empirical data was an obstacle to the adoption of duckweed technologies for wastewater phytoremediation to mitigate environmental pollution and valorise waste by many industries. Our results will considerably advance the development and optimisation of industrial large-scale systems - both of indoor (multi-layered, stacked) and outdoor (pond, lagoon, canal) models.

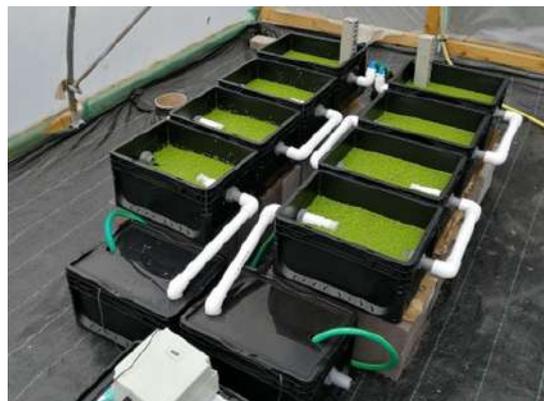
A parallel indoor growth system is currently being constructed at Aberystwyth, using experience gained by the UCC team. This will further increase our overall ability to produce a fit-for-purpose indoor cultivation system.

Below: Large scale systems, harvested duckweed, and exploration of different LED lighting regimes



Outdoor Systems

Outdoors, researchers have been testing the 80-litre systems currently set up in the polytunnel at Aberystwyth University Botany Gardens. Weekly measurements of duckweed biomass are taken, and environmental conditions such as water and air temperature are monitored to assess how these parameters affect duckweed growth in outside conditions.



Above: Duckweed growing in 80-litre systems in the polytunnel

This will help us to greater predict the operation of systems in a real life farm setting. The plan is to repeat these trial throughout the summer to assess whether findings seen on a small scale in the laboratory are transferrable to a larger scale.

Below: Duckweed growth on different dilutes of cattle slurry



We've also recently started larger scale trials using intermediate bulk containers (IBCs) in the glasshouses at Aberystwyth, with complimentary experiments conducted in UCC. This includes taking weekly measurements of duckweed yield, and collecting water samples to measure nutrient removal. Findings will feed into the final design of the IBC system, which will be used for upscaling lab trials, as well as for demonstration purposes to the public.

Below: IBCs in the glasshouses at Aberystwyth



In parallel, UCC researchers are using three lab-scale models (35-litres) to assess duckweed biomass production and nutrient uptake rates across different wastewater concentrations. These experiments take place in a semi-outdoor setting - a glasshouse under natural light conditions. This work is then upscaled to larger IBC tanks to test various volumes (ranging from 250 to 750-litres), led by Postdoctoral Researcher Dr Neil Coughlan, and underpinned by lab-based assessments led by Research Assistant Rachel O'Mahoney. These monitor the compatibility of different duckweed species and strains (i.e. ecotypes) across different farm-derived wastewaters, such as dairy parlour

yard-washings, and filtered swine effluents. Results so far show us that some strains of duckweed provide enhanced growth and nutrient removal, compared to others - a useful insight that will feed into overall system design.

Below: Project Steering Committee member Dr. SM Ashekuzzaman examining the outdoor systems at UCC with researchers



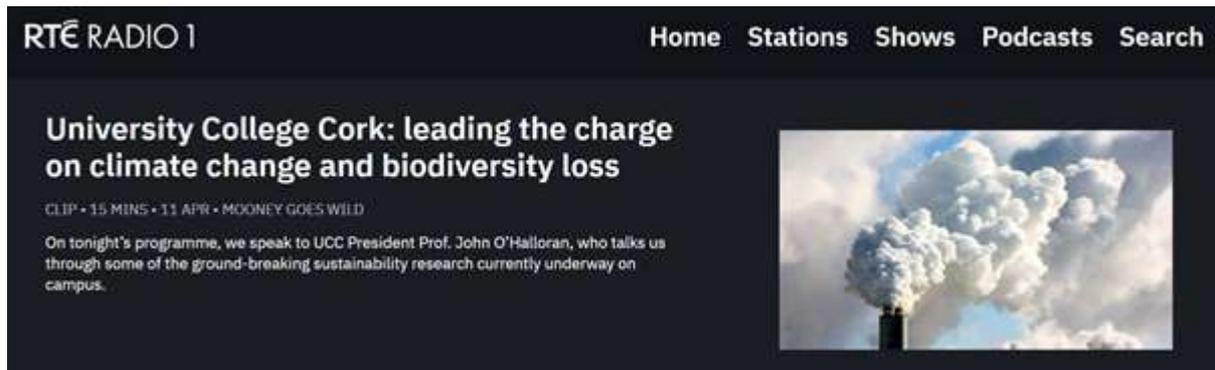
Taking to the airwaves for Mooney Goes Wild on RTÉ Radio 1



Above: UCC President Prof John O'Halloran (L) and Brainwaves' Prof Marcel Jansen (R) in studio for popular RTÉ Radio 1 wildlife and nature show, Mooney Goes Wild

Our own Professor Marcel Jansen took to the airwaves alongside President of UCC Professor John Halloran to talk about groundbreaking work on climate change, biodiversity loss and the circular economy being done at UCC, with a spotlight on the innovative phytoremediation work of the Brainwaves project.

Listen back [here](#) from 43 minutes in.



The image shows a screenshot of an RTÉ Radio 1 podcast player. At the top, it says 'RTÉ RADIO 1' on the left and 'Home Stations Shows Podcasts Search' on the right. The main title is 'University College Cork: leading the charge on climate change and biodiversity loss'. Below the title, it says 'CLIP • 15 MINS • 11 APR • MOONEY GOES WILD'. A short description follows: 'On tonight's programme, we speak to UCC President Prof. John O'Halloran, who talks us through some of the ground-breaking sustainability research currently underway on campus.' To the right of the text is a small image of a factory chimney emitting a large plume of white smoke into a blue sky with clouds.

Our Women & Girls in Science 2022



Above: Clockwise from top left: Niamh Daly, Anna Power, Aisling O'Flynn, Rachel O'Mahoney and Katie Sheehan all contribute to the Brainwaves project

February 11th marked the seventh annual [International Day of Women and Girls in Science](#), a day that recognises and promotes the contributions of women and girls in STEM (Science, Technology, Engineering and Mathematics) fields.

To mark their contributions, five of our research team shared their own stories as women in STEM. Check it out [here](#). Read more about how the Brainwaves project contributes to this year's IDWGS theme [here](#).

Europe Day 2022



Above and below: Brainwaves and other EU-funded projects greet members of the public during this year's Europe Day showcase at Wexford County Council offices

To mark [Europe Day](#) 2022, Brainwaves joined a public showcase of EU-funded projects held at Wexford County Council offices on May 9th. Nearly a dozen projects across the south and east regions of Ireland attended on the day, highlighting the extent of the exciting EU-funded work happening across a diverse array of sectors including tourism, technology and climate change.



Across the Irish Sea in Wales, the research team enjoyed an outdoor picnic with other EU-funded projects at Aberystwyth University.

Below: The Welsh team enjoying a well-earned break in the fresh air - at least the rain held off!



Dydd Gŵyl Dewi (St David's Day)

Dydd Gŵyl Dewi, celebrated on March 1st, is the feast of Saint David, the patron saint of Wales. As a proud [Ireland-Wales Programme](#) project, we co-hosted a Welsh-themed coffee morning with fellow Ireland-Wales project [Ports, Past and Present](#).

We gathered together in person, a treat in itself, to share connections and stories over Welsh cakes (a traditional type of sweetbread with raisins) and daffodils, the national flower of Wales. All the while mindful of a phrase attributed to St David: '*Gwnewch y pethau bychain mewn bywyd*' - or, '*Do the little things in life*'.

Read more about Welsh symbols [here](#).



Social Media

Follow our journey on Twitter [@BrainwavesEU](https://twitter.com/BrainwavesEU).

DMs are always open if you'd like to get in touch.

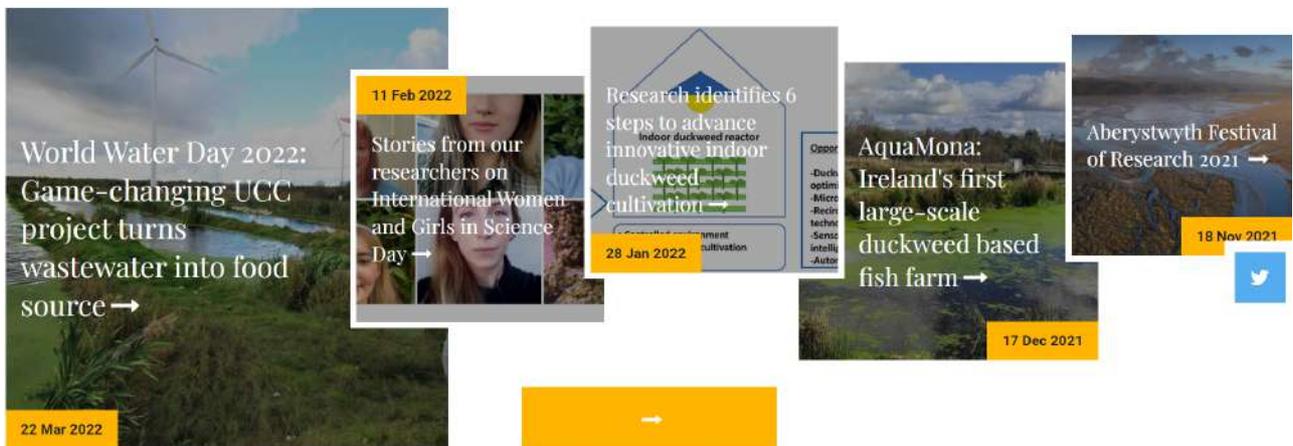


 **BRAINWAVES Project**
@BrainwavesEU

Today marks [#WorldWaterDay2022](#) ☐ Our research team work every day to contribute to the goal of cleaner water. Here'...
<https://t.co/iC9kAmpAyz>

8:59 AM - Mar 22, 2022

♡ 25  See BrainwavesEU's other Tweets



Project Website

Find all your Brainwaves-related information and resources here.

[Visit our website](#)

Footnote

By Research Assistant Rachel O'Mahoney

*We'd like to leave you with a poem on the theme of
interconnectedness*

Enjoy - Bain sult as!

Together we are in our shared diversity

Together we are in our shared diversity,
family and home are different for each of us,
as is so with all pieces of the biotic jigsaw, from
the monocotyledon macrophyte to the perennial oak tree,
to your family far and wide.

Each intrinsic to the diversity of the natural world,
each intrinsic to you and I.

Europe, a continent bound by two oceans and two seas
encompasses amongst the ongoings of each of us,
such diversity in all things living, beyond you, beyond me.
Imagine a small plant, on the surface of a slow-moving stream,
that carves out its life, in places of sun or colder extremes,
widespread, diverse, and genetically dispersed.

Our lives shaped by our geographic place.
Lemnaceae, a diverse family of aquatic plant,
present in Europe, and the world over,
let its biological classification capture your imagination.

From *Lemna minor* to *Lemna minuta*,
from *Lemna trisulca* to *Spirodela polyrrhiza*,
from *Wolffia arrhiza* to *Landoltia punctata*,
divergent in their choice of habitat,
distinct in their own local adaptations.

As Europe day approaches,
let's revel in our shared diversity,
wonder in our interconnectedness,
so delicate yet strong.

By Rachel O'Mahoney

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