

Duckweed

The tiny plant with big potential

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For The Estonian Chamber of
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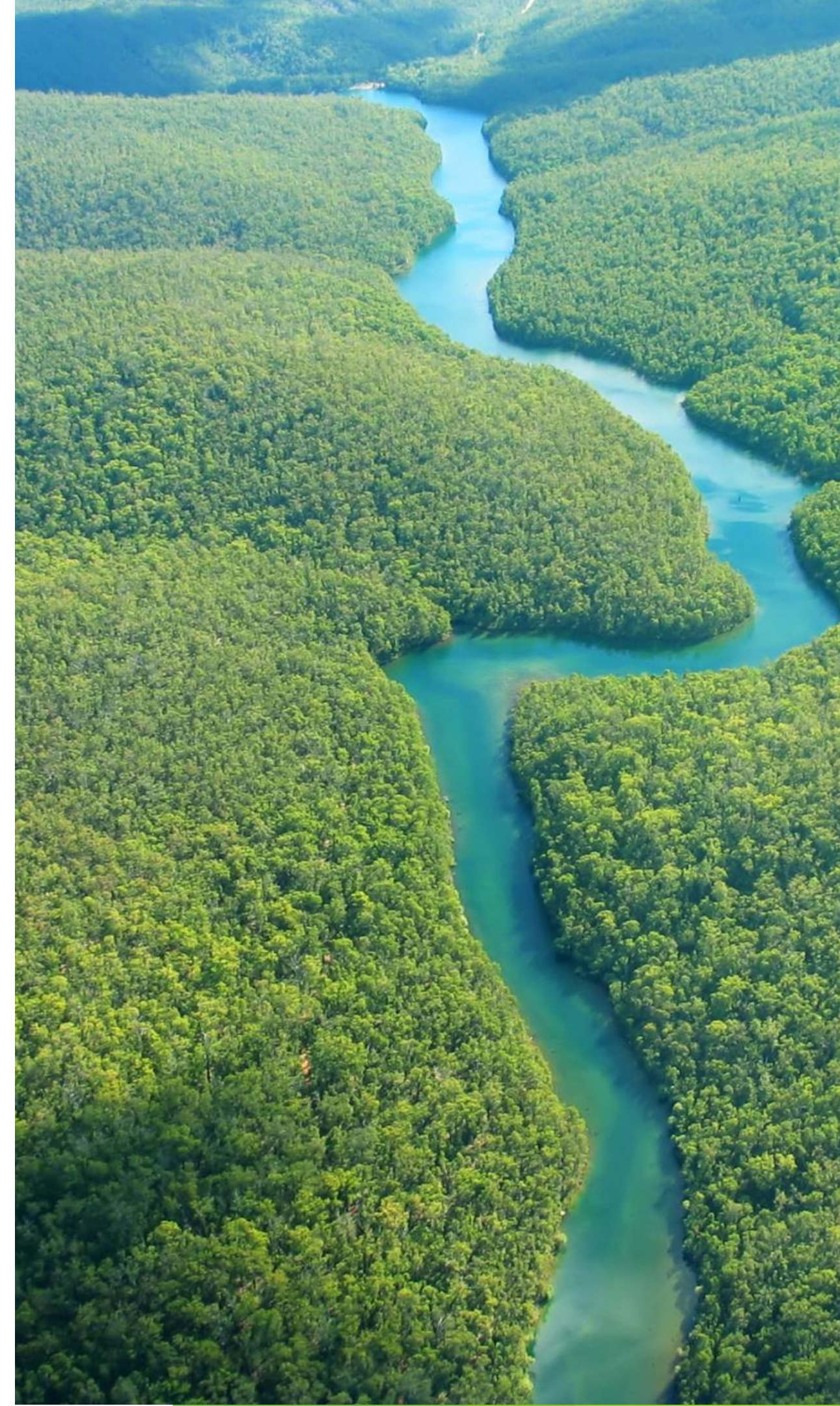
Introduction to Duckweed

- Duckweed is a small, fast-growing, flowering aquatic plant.
- It consists of a single oval shaped frond and has no leaves or stems.
- It is the world's fastest growing aquatic plant, doubling every 24 hours
- It reproduces quickly to form a dense carpet of duckweed on the surface of a body of water.
- It is an important food source to many aquatic animals such as fish and turtles.
- It purifies water through uptake of excess nutrients and pollutants.
- It sequesters carbon and improves biodiversity.



Habitat and Distribution

- Duckweed is found all over the world except for the polar regions.
- It is found in still or slow-moving bodies of water such as lakes, ponds and streams.
- It can survive in both tropical and temperate climates.
- It can thrive in many different water conditions such as different Ph levels, salinity levels and nutrient levels.



Nutritional Value

- Duckweed produces a high-quality protein concentrate as an ingredient for animal feeds; creating a valuable product from waste treatment.
- Much higher protein content than kale which has a crude protein content of only 16-18% (Teagasc)

(Klaus-J. Appenroth *et al.* 2017)



Environmental Benefits

- Duckweed absorbs nutrients and contaminants in water bodies making it a good water purifier.
- It is shown to reduce the turbidity of water as well as the number of bacteria present in water (JEI 2020)
- Due to its ability to purify water, there is a potential use for duckweed in bio-remediation of waste waters (Gupta and Dhan Prakash Prof 2014).
- Like other green plants, duckweed takes in CO_2 from the atmosphere and releases O_2 as it grows.
- It could be used as a meat substitute for human consumption which releases less greenhouse gas emissions.



Agricultural Uses

- Due to its high protein content and its dietary minerals, duckweed could be useful in animal feeds. It could be utilised as feed for a variety of different animals from fish to pigs and poultry.
- Duckweed is found to have a higher protein content per harvested area than soyabean, rice and corn. Soybean is also not accessible to many regions as it only grows in warmer regions so duckweed is more accessible.
- Due to its high Nitrogen content, duckweed can also be used as a natural fertiliser.



Medical and Industrial Uses

- Duckweeds have a lot of potential uses in the pharmaceutical industry due to their wide range of pharmacological effects. For example, duckweed species such as *L. minor* have antibacterial activity.
- Another potential use of duckweed in pharmacological studies is their use as a platform for human therapeutic protein production (Baek et al. 2021).
- Duckweed may be used as a biological bioreactor for the production of vaccines, antibodies, enzymes and pharmaceutical proteins.
- It has made a breakthrough as a chassis plant in biosynthesis and is being used to produce biological products that have many uses and have a high value (Yang et al. 2021).



The Business Case for Duckweed

- A business coupling waste treatment with protein production generates added value from waste treatment rather than incurring a cost for duckweed supply.
- 300 Ha site can produce 5,000 MT of duckweed Competing with fishmeal and soy at EUR1,000/MT.
- This equates to a EUR5 million per year business 5,000 MT protein concentrate.
- May replace about 50% of the protein concentrates, primarily fishmeal and soy, used by the Irish salmon industry.
- Additional revenue streams can be created from High value co-products (Glucose, Omega 3 fatty acids, Xanthophylls (Lutein) & Vitamin B12).

Challenges and Limitations

- Duckweed does not breakdown the pollutants that it takes in from water so when the duckweed dies and sinks to the bottom of the water and the pollutants are re-released into the water.
- Therefore, wastewaters that contain pharmaceuticals, metals and bacteria are not suitable for cultivation of duckweed for use in human or animal feed as these pollutants would be present in the feed (Coughlan *et al.* 2022)

- **Future Directions: Introducing The Green Farmer**

- The Green Farmer Co-Operative Society Limited (TGF) It is a collaborative community led by Farmers and Bio-Economy professionals developing practical and compliant solutions in the new Circular Bio-Economy.
- TGF is laying the groundwork for farmers to develop practical solutions to thrive in the new Circular Bio-Economy.
- Our organization fosters an environment of cooperation between farmers, scientists, entrepreneurs, regulatory agencies, traditional financial institutions and technology solution providers to accomplish our mission.
- TGF Co-Operative welcomes new members, including farmers and circular Bio-Economy professionals to join.
- The Green Farmer is affiliated with University College Cork and the Cocoreado Project.



UCC

Coláiste na hOllscoile Corcaigh
University College Cork, Ireland



Introducing the Cocoreado Project

- COCOREADO, which is inspired by the Esperanto for co-creation, is a project designed to rebalance the position of the farmer as an individual actor, as a key player in innovative food supply chains, and as a supplier for public procurement.
- The project will encourage young people in rural areas to co-create innovative solutions that overcome obstacles for farmers, address consumer needs and improve the conditions for the sustainable public procurement of local and seasonal food.
- The Green Farmer has been selected as an initiative for the Cocoreado project.



The Green Farmer recent AGM



Some more images of Duckweed



Conclusion

Duckweed is a promising green innovation that holds great potential for use in a range of environmental, agricultural and industrial areas.

Thank you for your attention
Any Questions?

Useful Links

The Green Farmer Website

- <http://greenfarmercoopltd.eu/>

Media Article: Duckweed: How a humble plant could help food security

- <https://www.agriland.ie/farming-news/duckweed-how-a-humble-plant-could-help-food-security/>

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Appendix

The Nitrogen Cycle with Duckweed

