

Session Biosphere: April 12th 11.30 hrs

1s4 Towards circular marine food production | Sustainable mariculture

What is the role of aquaculture in circular food systems?

Van Riel AJ 1,2), Nederlof MAJ 1), Wiegertjes GF 1), De Boer IJM 2)

1) Aquaculture and Fisheries group, Department of Animal Sciences, Wageningen University & Research, Wageningen, The Netherlands.

2) Animal Production Systems group, Department of Animal Sciences, Wageningen University & Research, Wageningen, The Netherlands.

Feeding humanity within the planetary boundaries is one of the grand challenges over the coming decades (Foley et al., 2011). Circular food systems are seen as a promising way to feed the rising population within these planetary boundaries (Ghisellini et al., 2016) One of the principles of a circular food system includes that each resource should be used in the way that is most valuable to the entire system. This implies that arable land should be used for production of human food and not for the production of animal feed. However, animals can play a valuable role in circular food systems due to their ability to convert by-products, unsuitable for human consumption, into high quality animal-source food (Van Zanten et al., 2019). Next to by-product from crops, livestock and fisheries, animals can also upgrade plant-based former foodstuff and grass resources, unsuitable for human consumption

In previous studies, the main focus has been on livestock (Van Zanten et al., 2019), while the role of aquaculture in circular food systems has been studied less. A recent study showed that fish can play an important role in a circular food system because they have an important role in the human diet (e.g. fatty acids) and, if harvested sustainably, capture fisheries can provide essential foods and aquaculture has additional advantages to livestock in the upcycling of by-products (Van Hal, 2020). The present study was restricted to two important species to represent aquaculture, a carnivorous (Atlantic salmon) and an omnivorous species (Tilapia), and did not include emissions associated to livestock or aquaculture. Unique characteristics of aquaculture, however, is that there are many species cultivated over a wide range of trophic levels, and that they are kept in a variety of housing systems. The variety of species cultivated and variety of production systems is expected to fulfil different roles in circular food systems.

The aim of this current project is to determine the role of aquaculture in circular food systems. We will use circular food system modelling to gain insights into what aquaculture species could be kept in which aquaculture systems, how much aquatic food could be produced and what by-products could be recycled as fish feed.

References

Foley JA, Ramankutty N, Brauman KA, et al. Solutions for a cultivated planet. *Nature*. 2011;478(7369):337-342. doi:10.1038/nature10452

Ghisellini P, Cialani C, Ulgiati S. A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *J Clean Prod*. 2016;114:11-32. doi:10.1016/j.jclepro.2015.09.007

Van Zanten HHE, Van Ittersum MK, De Boer IJM. The role of farm animals in a circular food system. *Glob Food Sec*. 2019;21:18-22. doi:10.1016/j.gfs.2019.06.003

Van Hal O. Upcycling biomass in a circular food system – the role of livestock and fish –. Published online 2020.

Keywords: Sustainability, circular bioeconomy, fish, food production