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EDITORIAL

On the "Aquaponic Corner" section of our Journal

Some readers of ***Ecocycles*** may find surprising that the journal opened a section called ***Aquaponic Corner***. Here we explain why we felt necessary to cover this specific area.

World problems related to food and water deserve particular attention. Malthus, more than two centuries ago, wrote that food shortages will lead to famine, wars, and mass migration (Malthus, 1798). By today, in several parts of the world, these predictions became true. We believe that the food production technology aquaponics may significantly contribute to the amelioration of these problems, especially, since it can be integrated in urban agriculture with ease.

What is aquaponics? First, a brief introduction for those who are not familiar with the subject. Aquaponics integrates recirculating aquaculture (RAS) with hydroponics (HP, soilless plant production). The technology is highly efficient: it uses the waste fish produce to feed the plants with nutrients. In addition to the fish tank(s) and the plant grow bed(s), an aquaponic system can also comprise sludge settling and biofilter unit(s).

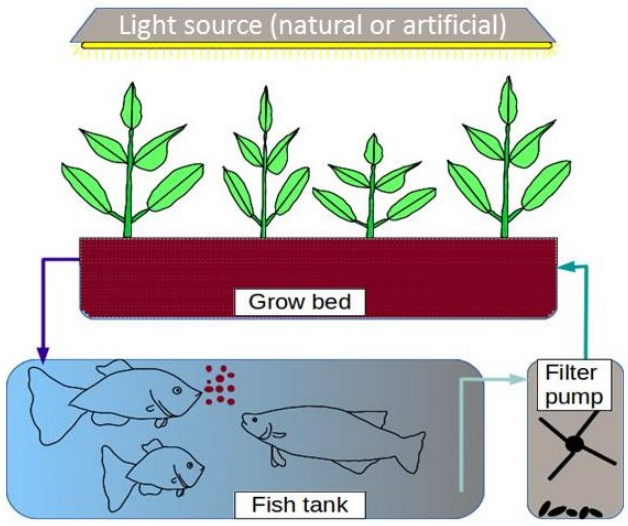

Figure 1. Simplified scheme of an aquaponic system. From (Bittsanszky et al., 2015), with permission.

The primary function of the latter is to detoxify ammonium (excreted by the fish) by converting in to the much less toxic nitrate, with the help of nitrifying bacteria (Pilinszky et al., 2015).

The basic idea of aquaponics is ancient: in South-East Asia rice has been grown in paddy fields in combination with fish since ca. 1500 years ago. About 500 years later (and not 3000 years ago as sometimes mistakenly quoted) the Aztecs also cultivated plants and fish together in their sophisticated *chinampa* systems (Merlin-Uribe et al., 2013). However, the recent, spectacular evolution of RAS and HP systems paved the way to a new, ecofriendly, high-tech aquaponic technology (Rakocy et al., 2004) (Graber and Junge, 2009) (Goddek et al., 2015).

As a food production method aquaponics can be considered as a highly efficient system based on an almost perfect ecological cycle. The inputa are water, fish feed, plant propagation material, and fish fingerlings. The end products are plant crop and fish, with significantly less waste generated as compared to separated RAS and HP systems. There are many advantages of aquaponics as compared to traditional methods: for example, food produced in aquaponic systems is certainly pesticide-free, since there are no chemical control methods yet developed for this technology (Pilinszky et al., 2015). As a matter of fact, the first example of a case study of the integrated pest management in an aquaponic system has been only recently presented at the International Plant Protection Congress (Bittsanszky et al., 2015).

However, there are certain disadvantages, too. Setting up, and operating of a commercial system under temperate climate conditions require thorough technical knowledge and a continuous monitoring of the circulating water (oxygen, pH, nutrient levels, etc.). Reliability of the mechanical parts is very important: fish rapidly die if the oxygen concentration in the water drops below a certain level. Thus, the system functions only if an uninterrupted supply of electric energy is available for water circulation. In addition, maintaining a nutrient balance in the system is very complicated: it reacts immediately to any changes in the fish/plant ratio.

In addition, although aquaponics has been practiced for many years now, its regulation as a food production technology is virtually non-existent in Europe (see the paper by Joly *et al*. in this issue).

Figure 2. An aquaponic system at the Institute of Natural Resource Sciences, Zurich University of Applied Sciences, Zurich, Switzerland (photo: Andreas Graber, with permission)

Interestingly, in spite of all the advantages, and the numerous problems to be solved, research findings on aquaponics are rather rarely published in academic journals. The reasons for this are not known, however one can guess that below the surface of a seemingly simple biological system (plants, fish, and nitrifying bacteria) an intricate web of interdependencies makes it difficult to carry out reproducible investigations. It can also be assumed that relevant knowledge is generated by aquaponic start-up companies who are not focused on publishing results. With the opening of the ***Aquaponic Corner*** in this journal we wish to initiate and promote open exchange of knowledge, science-based opinions, and discussion on the subject.

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References

Bittsanszky, A., Gyulai, G., Junge, R., Schmautz, Z., Komives, T., 2015. Plant protection in ecocycle-based agricultural systems: aquaponics as an example. Presented at the IPPC 2015, Berlin.

Goddek, S., Delaide, B., Mankasingh, U., Ragnarsdottir, K.V., Jijakli, H., Thorarinsdottir, R., 2015. Challenges of sustainable and commercial aquaponics. Sustainability 7, 4199–4224. http://dx.doi.org/10.3390/su7044199

Graber, A., Junge, R., 2009. Aquaponic Systems: Nutrient recycling from fish wastewater by vegetable production. Desalination 246, 147–156. http://dx.doi.org/10.1016/j.desal.2008.03.048

Malthus, T., 1798. An Essay on the Principle of Population. Printed for J. Johnson, in St. Paul's church-yard, London.

Merlin-Uribe, Y., Gonzalez-Esquivel, C.E., Contreras-Hernandez, A., Zambrano, L., Moreno-Casasola, P., Astier, M., 2013. Environmental and socio-economic sustainability of chinampas (raised beds) in Xochimilco, Mexico City. Int. J. Agric. Sustain. 11, 216–233. http://dx.doi.org/10.1080/14735903.2012.726128

Pilinszky, K., Bittsanszky, A., Gyulai, G., Komives, T., 2015. Plant protection in aquaponic systems - Comment on "A novel report of phytopathogenic fungi *Gilbertella persicaria* infection on *Penaeus monodon*." Aquaculture 435, 275–276. http://dx.doi.org/10.1016/j.aquaculture.2014.09.045

Rakocy JE et al. (2004). Update on tilapia and vegetable production in the UVI aquaponic system). In: New Dimensions on Farmed Tilapia: Proc. of the 6th International Symposium on Tilapia in Aquaculture, September, 12 – 16, 2004.