Agriculture (including forestry), food security, food health & safety, and climate change pose key challenges for the world. The production of agri-food is highly exposed to climate change – the variability of crop yields has already increased as a consequence of extreme climate events. Moreover agriculture has to meet a demand for food which is estimated to rise globally by 50% by 2030 and to double by 2050, due to population growth, urbanisation and increased affluence in many societies. Finally, fish stocks are plummeting, while large-scale farming on land has various adverse impacts, including external pollution (e.g., of soil) and health hazards (see www.nutritionresearchcenter.org/healthnews/farm-raised-fish-not-so-safe/).

Essentially food production systems and populations’ consumption patterns need to become more sustainable. To address this challenge, and increase the potential to supply fresh food, advanced technologically integrated systems have to be explored to ensure a continuity of food supply. In this context there have been various initiatives to re-design food provisioning and move beyond the traditional focus to include innovative Aquaponic projects.

Aquaponics describes the combination of two principal growing processes working in harmony to deliver one, self-sustained system. These two are Aquaculture and Hydroponics. Aquaculture is the farming of aquatic animals and plants for food, in natural or controlled marine or fresh water environments. Hydroponics is the process of growing plants in sand, gravel, or liquid, with added nutrients but without soil. The idea is to combine these techniques together within the same system, so that the positives of both are multiplied and negatives of each are cancelled by each other. The integrated system of Aquaponics has benefits not achievable when Aquaculture and Hydroponics are applied separately. Aquaponics takes both of these principles and turns problems into solutions, as the waste in the water is used to feed the plants, therefore not requiring any chemical nutrients to be added to the system; moreover there is no pollution of the environment by either fish waste or chemical pollutants (Bernstein, 2011).

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Key benefits of Aquaponics over competing technologies are: food security, food health and safety (Ex: direct access to nutritious food in both urban and rural areas), reduced water use, reduced carbon footprint, reduced chemical use, reduced erosion of soils, and reduced need for land. Some believe that the role of Aquaponics is going to be more important in the future given that our natural systems are forced towards increasing unpredictability. In fact existing production units have demonstrated that Aquaponics permits the producer to be more efficient with water, energy, and to protect the crops from the elements. Furthermore Aquaponics can bring a new approach to the sustainability of landscapes, urban agriculture and the sustainability of cities by turning wastes into resources and transforming disused urban spaces to provide not only food, but resilient communities (Price, 2012). In addition, Aquaponics has a high potential to revitalize cities and to create jobs (IBM, 2011).

From primarily a hobby and backyard system, Aquaponics is developing and the number of small commercial and large-scale commercial Aquaponics systems is increasing. On a purely commercial basis Aquaponics has been demonstrated to be economically viable. As one can verify in BAQUA’s report (Veludo, M., Hughes, A. and Le Blan, B., 2012), the rate of development of research, technologies, production units (i.e. small and large-scale profitable systems) and educational programs in the last two years is impressive.

The potential of an opportunities for Aquaponics can be viewed through multiple lenses, including its contribution to community transformation (Ex: through urban and peri-urban agriculture), Aquaponics industry development, industrial change and development and the implementation of European Policies and Programmes.

Though it has a great potential to produce for the world, Aquaponics is a young science and the development of newer technology in the field is still progressing. The scientific and engineering challenges associated with Aquaponics are immense, but the opportunities are great as well (IBM Report, 2011). Challenges in Aquaponics centre around issues (Roe and Midmore, 2008) such as certification, the economic structure that best suit skills, needs and budgets, the dynamics of nutrient extraction, technology transfer to the appropriate end users, the source of fish food and parasitology.

Aquaponics appears to be a very important part of the solution to our planet’s impending food shortages and needs for healthy and safe food. Some view this technology as the new revolution in food production (Martin Schreibman, Brooklyn College, City University of New York, USA, 2010).

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