

TOWARDS A SUSTAINABLE AQUAPONIC FARM MODEL IN BELGIUM: PRODUCTIVITY AND ECONOMIC ANALYSIS OF TWO CONTRASTING FISH PRODUCTION MODELS (TILAPIA VS PIKEPERCH)

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Thanks to its key strengths such as water use efficiency and nutrient recycling, aquaponics is considered as a sustainable food production method and is still getting growing interest in the scientific community, producers and a broad general public. It meets commonly shared consumer expectations toward food production such as: local production, fresh, healthy (pesticide-free), diversified products, environmentally friendly and low CO₂ emissions. It is also in line with the EU strategy to promote sustainable food systems, specially fish farming. However, commercial aquaponics production remains in its infancy as regulations and profitability weakness act as a serious brake on further growth (Turnsek et al., 2020; Fruscella et al., 2021).

With the aim of creating robust foundations for the development of an aquaponic farm in Belgium, we set up an aquaponic pilot production system designed to test and compare different agronomic and economic models, sizeable to a commercial scale.

This coupled aquaponic system (total volume: 18 m³) presents a 8 m³ fish production capacity and 50 m² of crop production in raft and NFT, equipped with LED lighting. The two fish production models were tilapia (*Oreochromis niloticus*), a tropical fish species, highly productive, with a relatively low market price, and pikeperch (*Sander lucioperca*), a temperate fish, less productive but with an added commercial value. Vegetable production included lettuce, basil, coriander, parsley and rocket salad.

Data covering biological production (growth and survival), energy and water use, and physico-chemical functioning were collected during 1 year for tilapia and during 2.5 years for pikeperch production, supporting a deep analysis of fish-vegetable productivity, and operational costs.

A market analysis targeting distribution of aquaponic products was also carried out to quantify the local demand and sale prices, define the distribution channels and their capacity. First results show that, even if tilapia is 3-fold more productive than pikeperch, associated vegetable production was relatively higher with pikeperch and economical balances are similar for both models, as the high value of pikeperch offsets its lower production.

Finally, production, economical (investment and operational costs) and market data will be evaluated together to come up with recommendations on operational marketing (targeted products and markets) and more technically, on farm sizing and design. The ultimate output will be the production of a business model integrating all these data and proposing a reliable aquaponic farm model.

References

- Fruscella L, Kotzen B, Milliken S (2021). Organic aquaponics in the European Union: towards sustainable farming practices in the framework of the new EU regulation. *Reviews in Aquaculture* 13: 1661-1682.
- Turnsek M, Joly A, Thorarinsdottir R, Junge R (2020). Challenges of commercial aquaponics in Europe: beyond the hype. *Water* 12: 306.