FrontAg Nexus

Practice Abstract

Aquaponics: A Water-Saving Solution for Integrated Food Production in the Mediterranean

Problem/Challenge

The interdependence of water, energy, food, and ecosystems (WEFE Nexus) is severely challenged by water scarcity in the Mediterranean, necessitating innovative agricultural solutions. Traditional farming and aquaculture methods often lead to high water consumption and nutrient waste, underscoring the urgent need for integrated, resource-efficient food production systems to ensure regional sustainability.

Our Solution/Key Finding

The FrontAg Nexus project promotes integrated aquaponics and Recirculating Aquaculture Systems (RAS) as a circular food production solution. These closed-loop systems efficiently combine fish farming with soilless plant cultivation, leveraging nutrient-rich aquaculture water to fertilize crops. This innovative approach optimizes resource use by minimizing water discharge and recycling nutrients, embodying a waste-to-resource philosophy.

Benefits & Impact

Aquaponics offers significant water savings, up to 90% compared to conventional agriculture [1]. This integration leads to efficient protein (fish) and vegetable production, reducing environmental impact and promoting nutrient cycling. The Israeli case study demonstrates promising profitability and substantial WEFE Nexus advantages through enhanced water use efficiency [2]. While technically mature, business and social readiness (BRL/SRL) are moderate, requiring strategic planning [3].

Applicability Box

Theme: Sustainable Aquaponics for Resource Efficiency & Circularity

Keywords: Aquaponics, Water Saving, Integrated Food Production, Nutrient Recycling, Circular Economy, Mediterranean

Context: Arid and semi-arid regions, small to commercial scale farms, agricultural policy development.

Required Resources: Initial infrastructure investment, technical knowledge for system operation.

Scalability: Applicable from small-scale household units to large commercial facilities.

Readiness Levels: High TRL (7-8), Moderate BRL/SRL (4-6) due to operational costs and market acceptance [3].

Risk Management/Considerations: Requires careful management of water quality and nutrient balance; initial operational and labour costs can be high.

Practical Recommendations

Farmers should explore aquaponics/RAS for diverse crop and fish production, focusing on system design for nutrient recovery and water conservation, potentially starting with small-scale or pilot systems for local markets. Policymakers can foster adoption through incentives for closed-loop systems, and by supporting research and development in sustainable

integrated food technologies to elevate their business and social acceptance.

References and Further Information

[1] L. Suarez and e. al., "Water use efficiency in aquaponic systems: a review," *Water,* vol. 13, no. 18, p. 2503, 2021.

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[4] E. Appolloni, V. Cerasola, G. Pennisi, W. Biru, G. Buchenrieder, T. Uyar and Y. Yavuz, "D1.1: Systematic literature review (SLR) of frontier agriculture systems and empirical evidence in the Mediterranean Region," FrontAg Nexus Project Deliverable, Bologna, 2023.

About this practice abstract

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FrontAg Nexus: The project was launched in May 2023 to promote sustainable agri-food practices by applying the Water-Energy-Food-Ecosystems (WEFE) Nexus approach. Focusing on six Mediterranean countries—Israel, Italy, Morocco, Tunisia, Turkey, and Jordan—the project addresses climate change, resource scarcity, and food insecurity through collaborative research and innovation.

Project Website: https://frontagnexus.eu

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