

A new soilless cultivation system for tomato production in south of Italy

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Southern Italy boasts the second-largest greenhouse horticultural production area in Europe, covering around 9,000 hectares. Fresh market tomatoes are a significant greenhouse crop in Sicily, with nearly 3,038 hectares and a total production of 203,223 tons. Greenhouse tomato cultivation involves both soil and soilless systems with various substrates. Effective management of water and fertilizer in this context hinges on a comprehensive dataset encompassing environmental, soil, and crop information, crucial for informed decision-making. To avoid resource waste, environmental damage, and unstable yields, it's imperative to develop sustainable greenhouse systems, especially considering the growing global population and increased food demand.

Among the methods that don't require a substrate, there is an innovative approach known as "agriponic." In this approach, tomato plants (1.5 plants/m²) were positioned above closed polystyrene channels. Their roots, partially suspended and in contact with the channel's bottom, receive intermittent fertigation sprays, with excess solution recaptured for reuse, forming a closed-loop system. These systems contribute to reduced water and nutrient consumption. The study was aimed at evaluating the performance and resource efficiency of the "agriponic" closed-loop system in a 1,200 m² greenhouse in southern Italy, comparing it to a traditional soil-based system. Data on greenhouse climate, water, and nutrient inputs were gathered during the experiment. Plant growth, phenology, and leaf gas exchange and production data were registered during tomato cycle (January July). In the "agriponic" system, in the first months, plant growth was slower compared to the soil-based system, which was consistent with photosynthetic measurements. However, there were no differences in phenological stage timing between the two systems. The first harvest, carried out 122 days after transplanting, revealed a higher tomato yield in "agriponic" in comparison to the soil-based system. The "agriponic" system demonstrated a decrease in water and nutrient usage, showcasing its strong environmental sustainability and efficient tomato production capabilities.