

Food-water-energy nexus of greenhouse vegetable in Shandong province

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ABSTRACT

As a major vegetable planting province, Shandong is the national greenhouse vegetable center. The coupling relationship of food-water-energy based on greenhouse vegetables still remains lack for regions. Given this, the study proposes a nexus framework of greenhouse vegetable-water-energy, and the planting status and distribution of greenhouse vegetables in Shandong province were investigated. Then, based on life cycle analysis (LCA), the groundwater resource consumption and energy consumption related to water withdraw in greenhouse vegetable planting were calculated, and the pressure on local resources caused by greenhouse vegetable planting was evaluated and spatialized. Finally, based on the scenario simulation, the planting structure of greenhouse vegetables under the constraint of water resources and energy was optimized in order to achieve a high nexus degree of vegetable-water-energy coordination on the basis of ensuring the yield of greenhouse vegetables. Overall, this study proposes a framework for quantifying the water and energy consumption in vegetable production and provides a new paradigm to understand the vegetable-energy-water nexus.

Keywords: Greenhouse vegetable-water-energy nexus, LCA, groundwater resource consumption, energy consumption