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## A Promising Solution of the Urban Water-Food-Energy Nexus: Actuating Rooftop Farming in Northern Taiwan Cities

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### Abstract Text:

With intensifying urbanization and climate change impacts, the increasing demands for water, food and energy have put heavy pressures on resource stocks and utilization efficiency. Therefore, it is important to adopt a more integrated perspective to tackle these issues to “aim high on sustainability while engage from the ground substantially at the same time”. To balance food production against environmental sustainability, the study focuses on the rooftop farming, serving as a practical green infrastructure from the urban WFE Nexus perspective, to address the benefits at city scale to enhance resource management. It incorporates well-designed mechanism by collecting rainwater and green energy to support producing fresh vegetables as “reasonable crop production with minimum resource use” to provide for local fresh diets, as well as to improve environmental quality in urban areas.

We intend to study the efficiency of resource utilization from water and energy sectors to support vegetables production. Through the analysis of historical weather data to cluster the climate-features via Self-Organized Mapping approach (SOM), and the mechanism of rooftop farming constructed via System Dynamics Modeling (SDM), we integrate the regional climate features and the rooftop farming to conduct scenario simulations to explore how resources variation affect food production in urban setting. The results of optimal resource utilization and food production on urban rooftops can help allocating vegetables growing in suitable climate area and with potentially minimum water and energy consumption. Further evaluation of WFE Nexus efficiency and promotion strategy can encourage city governments to reconsider new comprehensive planning on urban land use and natural resource collection for local fresher food provision. With extensive installation within city, the rooftop farming helps to facilitate as adaptation measures to food insufficiency and sale fluctuation under climate change impacts especially after disasters.