Experimental Analysis of the Benefits and Drawbacks of Rooftop Agriculture

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Several theoretical models of rooftop gardening have been developed to determine the economic feasibility of a green roof by weighing the economic benefits and drawbacks. In this experiment, a mathematical model of rooftop agriculture was used as a framework for an experimental analysis of these benefits and drawbacks, and was revised to fit the circumstances of the experiment. Rooftop agriculture was simulated using four bins, one serving as the control and the other three as experimental units. Atop each experimental unit sat a tray containing one of three different soil depths in addition to a filter layer, drainage layer, and an insulation layer. Identical quantities of strawberry and lettuce plants representing rooftop agriculture were planted in each. Holes were cut in the bottom corner of each tray and fitted with drainage tubes and sleeving to collect gray water. The following daily measurements were collected: outside temperature, internal building temperature, strawberry yield (quantity and weight), lettuce yield (quantity and weight), soil moisture, amount of water collected, and amount of water required for maintenance. The measurements were used to calculate payback periods of variously-sized rooftop agriculture plots, and these payback periods were compared to the payback periods from the theoretical model. The payback periods from experimental data were found to be significantly less than those from the theoretical data. The purpose of this investigation is to experimentally analyze the benefits and drawbacks of rooftop agriculture and determine whether the analysis validated a previously developed mathematical model.

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