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Economic Analysis of Rainwater Harvesting Systems for Dairy Cattle

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Abstract : Economic analysis of Rainwater harvesting (RWH) systems is vital in search of a cost-effective solution to water unreliability, especially in low-income countries. There is little literature focusing on the financial aspects of RWH for dairy farmers. The main purpose was to assess the economic viability of rainwater harvesting for diary framers in the Rwenzori region. The study focused on the use of rainwater harvesting systems from the rooftop and collection in above surface tanks. Daily rainfall time series for 12 years was obtained across nine gauging stations. The daily water balance equation was used for optimal sizing of the tank. Economic analysis of the investment was carried out based on the life cycle costs and the accruing benefits for the period of 15 years. Roof areas were varied from 75m2 as the minimum required area to 500m2 while maintaining the same number of cattle and keeping the daily water demand constant. The results show that the required rainwater tank sizes are very large and may be impractical to install due to the strongly varying terrain and the initial cost of investment. In all districts, there is a significant reduction of the volume of the required tank with an increasing collection area. The results further show that increasing the collection area has a minor effect on reducing the required tank size. Generally, for all rainfall areas, the reliability increases with an increase in the roof area. The results indicate that 100% reliability can only be realized with very large collection areas that are impractical to install. The estimated benefits outweigh the cost of investment. The Present Net Value shows that the investment is economically viable and investment with a short payback of a maximum of 3 years for all the time series in the study area.

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