

Probabilistic assessment of the rainwater harvesting potential of schools in South Africa

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Abstract In comparison to other sources of water supply, rainwater harvesting (RWH) has the typical advantages of being cheaper and easier to operate and maintain. This study aimed at assessing the hydrologic rainwater harvesting potential of rural schools in South Africa by obtaining RWH storage capacity (level of supply) reliability relationships of representative schools. Thirty-two schools located in three rural areas that have varied rainfall characteristics were selected for the analysis. For each school, a daily time-step behaviour analysis of the rainwater harvesting system with a specified storage was carried out for a period of 101 years (over which rainfall data was available) and the number of days that the school's daily water demand was met in each year obtained. Using the Weibull plotting position formula, the expected number of days that the demand can be met per year was then obtained for 85, 90 and 95% reliability. For the two summer rainfall regions where a large proportion of rain falls during school holidays, the expected number of days of supply per year improved up to a storage capacity of 25 m³. For the winter rainfall region where the rainfall periods and school learning times have more coincidence, a tank volume of 5 m³ obtained similar supply levels as larger capacities. At 90% reliability, the supply levels for different schools in the summer rainfall area with a mean annual precipitation (MAP) of 800–1000 mm/year ranged from 60 to 120 days per year, while the summer rainfall region with a lower MAP (500–600 mm) gave supply levels ranging from 40 to 70 days per year. The winter rainfall area had a MAP of 500–600 mm and obtained supply levels ranging from 60 to 80 days at 90% reliability.

Key words rainwater harvesting, storage, reliability, days of supply, schools