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# Water, Energy and Agricultural Landuse Trends at Shiroro Hydropower Station and Environs.

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The study examines the interplay among water resources, hydropower generation and agricultural landuse at Shiroro hydropower station and environs, in north-central Nigeria. Non-parametric trend analysis, hydropower footprint estimation, reservoir performance analysis, change detection analysis, and inferential statistics were combined to study the water-energy and food security inter-connection. Results of Mann-Kendall test and Sen's slope estimator for the period 1960 to 2013 showed a declining rainfall trend at Jos, around River Kaduna headwaters at -2.6mm/year, while rainfall at Kaduna and Minna upstream and downstream of the reservoir respectively showed no trend. Estimates of hydropower footprint varied between 130.4 and 704.1m3 GJ-1 between 1995 and 2013, power generation reliability and resilience of the reservoir was 31.6% and 38.5% respectively with year 2011 the most vulnerable and least satisfactory. In addition to poor reliability and resilience indices other challenges militating against good performance includes population growth and climate change issues as exemplified by the downward trend observed at the headwaters. Relationship ($r^2$) between water inflow and power generation shows a weak positive relationship at 0.48 indicating less than optimal power generation with consequences for the local economy, especially agro-allied industries. Total area of land cultivated increased from 884.59km2 in 1986 prior to the commissioning of the hydropower station to 1730.83 km2 in 2016 which signifies increased contribution of the dam to ensuring food security. While a long term roadmap to optimise the use of the dam for power generation is needed, an immediate effort to maximize the comparative advantage in the agricultural land cultivation should be pursued.

Keywords: Hydropower, Reservoir performance; Food Security; Rainfall; River Kaduna