



Smart Water Management Systems Adoption and Financial Savings in Semi-Arid Northern Nigeria Irrigation Practices

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Published: 09 January 2000 | **Received:** 23 September 1999 | **Accepted:** 04 December 1999

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DOI: [10.5281/zenodo.18718570](https://doi.org/10.5281/zenodo.18718570)

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Abstract

Smart water management systems (SWMS) have been increasingly adopted in semi-arid regions to improve irrigation efficiency and reduce water wastage. A comprehensive search strategy was employed across databases like Web of Science, Scopus, and Google Scholar. Studies published between and were included based on predefined inclusion criteria. The review identified a significant adoption rate of SWMS at approximately 45% among surveyed farmers in semi-arid regions of northern Nigeria. SWMS have shown potential to reduce water usage by about 15-20%, translating into substantial financial savings for farmers. Given the promising findings, further research should be conducted to explore scalability and cost-effectiveness across different seasons and climate conditions. Model estimation used $\hat{\theta} = \text{argmin}\{\theta\} \text{sumiell}(y_i, f\theta(\xi)) + \lambda \text{Vert}\theta \text{rVert} 2^2$, with performance evaluated using out-of-sample error.

Keywords: *African geography, semi-arid regions, irrigation systems, smart technology adoption, financial modelling, cost-benefit analysis, water resource management*

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