NIGER STATE POLYTECHNIC, ZUNGERU - NIGERIA

JOURNAL OF HUMANITY, SCIENCE AND TECHNOLOGY (JOHSAT)

ISSN (Print): 2789-4312 | ISSN (Online): 2789-4320 | Vol. 2 No. 1 (2026) | pp. 57-70

DOI: https://doi.org/10.58921/johsat.v2i1.005

IoT-Enabled Precision Irrigation Systems for Smallholder Cereal Farmers in the Guinea Savannah Zone: A Review

Authors: Yusuf A. Garba, Bilkisu M. Aliyu

1. Department of Computer Engineering, Niger State Polytechnic, Zungeru, Nigeria; 2. Department of Agricultural Bio-Environmental Engineering, Federal Polytechnic, Bida, Nigeria

ABSTRACT

Climate variability and erratic rainfall patterns across the Nigerian Guinea Savannah increasingly threaten food security and smallholder farm productivity. This review synthesizes recent advancements in low-cost Internet of Things (IoT) soil-moisture sensing, LoRaWAN wireless telemetry, and solar-powered automated drip irrigation architectures suitable for smallholder cereal cultivation. Key technical bottlenecks???including sensor calibration drift in ferruginous tropical soils, power management, and local maintainability???are critically evaluated alongside a proposed reference blueprint for local fabrication within polytechnic engineering workshops.

Keywords: Precision Agriculture, Internet of Things, Smart Irrigation, Guinea Savannah, Food Security

1. INTRODUCTION

This peer-reviewed article is published Open Access under the Creative Commons Attribution 4.0 International License (CC BY 4.0) by the Directorate of Research, Innovation & Development, Niger State Polytechnic, Zungeru. Full empirical datasets, methodology protocols, and analytical derivations are archived in the JOHSAT repository.