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Design and Implementation of a Sprinkler Irrigation System for plantain cultivation in the M'batto region (Central-East Côte d'Ivoire)

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ABSTRACT
Objective: In Côte d'Ivoire, climate variability severely threatens the productivity of plantain (*Musa paradisiaca*), a crop highly dependent on rainfall. This study, conducted in M'Batto (Moronou Region, Central-East Côte d'Ivoire), aims to design and evaluate an optimal sprinkler irrigation system to compensate for crop water deficits.
Methodology and Results: The methodology relies on climate data processing using CLIMWAT 2.0 and CROPWAT 8.0 software to estimate reference evapotranspiration (ET_0) and crop water requirements based on the Penman-Monteith approach. The hydraulic network dimensioning was modelled using IRRICAD Pro V16, Global Mapper, and AutoCAD software. The results reveal an annual ET_0 of 1,037.87 mm against a maximum crop water requirement estimated at 2,000 mm, highlighting a critical water deficit of 962.13 mm/year. To address this deficit, a sprinkler irrigation network with an overall capacity of 24.1 m³/h was designed for a 0.77-hectare pilot plot. The developed optimal layout comprises 3 irrigation blocks and 75 sprinkler risers (25 per block) operating at a sectoral flow rate of 10 m³/h. On-site field tests confirm hydraulic efficiency and uniform water distribution, offering a replicable technical solution to secure plantain yields in the region.
*Conclusion and Application of results***:** In conclusion, this engineered sprinkler layout successfully mitigates severe seasonal moisture stress in the Moronou region. To maximize agricultural resilience, it is recommended that local smallholders and agricultural cooperatives adopt this sectorized network configuration. Furthermore, transitioning toward solar photovoltaic pumping is highly recommended to eliminate fossil fuel dependency and reduce long-term operational costs.
Keywords: Agricultural engineering, Water requirements, CROPWAT, Hydraulic design, *Musa paradisiaca*.