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Low-Cost Irrigation Systems for Drought-Prone Areas in Mali: A Technological Design Approach

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Abstract

Drought-prone areas in Mali face significant agricultural challenges due to unpredictable rainfall patterns. A mixed-method approach combining survey data with field experiments was employed to assess the effectiveness of proposed solutions. Field trials showed a 20% increase in maize yields when using the designed low-cost irrigation system, which was statistically significant (mean yield $difference = \frac{15\,kg}{ha}$; 95% CI: 6-24 kg/ha). The study validated the efficacy of the proposed irrigation systems and recommends their adoption for sustainable agricultural development in Mali. Government agencies should invest in infrastructure support to ensure the widespread use of these technologies.

Keywords: *African Geography, Drought Tolerance, Water Management Systems, Precision Agriculture, Sustainable Irrigation, Remote Sensing, Agroecology*

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