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Integrated Watershed Management Techniques for Sustainable Agriculture and Water Supply in Chad: A Methodological Approach

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Abstract

Integrated watershed management (IWM) techniques are crucial for sustainable agriculture and water supply in arid regions such as Chad, where climate variability exacerbates existing challenges. A mixed-methods approach combining GIS-based analysis, expert interviews, and participatory workshops was employed to identify key management strategies. Statistical models were used to predict soil erosion rates and evaluate water storage capacities. The IWM model predicted that a 20% increase in water availability could lead to a 15% reduction in sedimentation in rivers, demonstrating the potential of strategic interventions for sustainable watershed development. The study validated the efficacy of IWM techniques and identified key areas requiring further research and implementation. Future work will focus on scaling up these models across similar regions in Chad. Local communities should be actively involved in decision-making processes to ensure sustainability and long-term benefits from IWM initiatives. Policy makers should support financial incentives for adopting sustainable water management practices. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, GIS, remote sensing, watershed delineation, sustainable farming practices, participatory mapping, ecosystem services assessment*

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