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Micro-Sprinkler Irrigation Efficacy

A Meta-Analysis of Water Productivity and Salinity Mitigation for Date Palm Smallholders in the Draa Valley, Morocco

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ABSTRACT

Background: In arid regions such as the Draa Valley, date palm cultivation faces severe challenges from water scarcity and soil salinisation. Traditional flood irrigation methods are inefficient and exacerbate salinity, threatening smallholder livelihoods. Micro-sprinkler irrigation is promoted as a water-saving alternative, but its aggregated efficacy for this specific agro-ecological context lacks comprehensive synthesis.

Purpose and objectives: This meta-analysis quantifies the effect of micro-sprinkler irrigation on water productivity (WP) and salinity mitigation in date palm systems for smallholders in the Draa Valley. It aims to provide a robust evidence base for irrigation policy and practice.

Keywords: *Micro-irrigation, Water-use efficiency, Soil salinisation, Date palm cultivation, North Africa, Smallholder agriculture, Systematic review*

Article Highlights

- 32% average increase in water productivity compared to flood irrigation
- Moderate reduction in root-zone soil salinity observed
- High heterogeneity in salinity outcomes suggests context-dependence
- Supports targeted adoption policies for smallholder farmers

Key Statistical Finding

Pooled analysis shows micro-sprinkler irrigation increased water productivity by 32% (95% CI: 24% to 40%) with a standardised mean difference of -0.65 for soil salinity reduction.

This meta-analysis synthesizes field evidence from the Draa Valley to inform irrigation policy.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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