

An Integrated Performance Index for Irrigation Schemes in Sri Lanka: An Interdisciplinary and Sustainable Approach

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Irrigated agriculture is vital for Sri Lanka's food security but faces growing sustainability pressures from population growth and limited water and land resources. Therefore, assessing and improving the performance of existing irrigation schemes is a crucial, cost-effective strategy. However, most performance assessments use mono- or multidisciplinary approaches that fail to capture the complex and interconnected nature of these systems. To address this gap, a generic, interdisciplinary composite index was developed, prioritizing simplicity, traceability, and interpretability. The index conceptualizes a scheme as two subsystems: the 'Water Delivery System' (includes all activities and components from water sourcing to field delivery) and the 'Agricultural Production System' (includes all activities and components from field application, to crop output and benefit distribution). The index incorporates 26 input, process, and output indicators covering technical, managerial, economic, environmental, and social dimensions. All indicator values are normalized on a 0–100 scale to ensure comparability. The relative importance of indicators in each subsystem is identified using the Analytic Hierarchy Process (AHP) through expert judgment. To obtain the final score for the index, both weighted additive aggregation and weighted geometric methods are used. Based on this score, schemes are classified into one of four performance levels: Poor (<50), Average (50-70), Good (70-90), or Excellent (>90). To demonstrate its utility, the index was applied to a simulated dataset, yielding an overall score of 79 ('Good'). The developed index is a valuable tool for identifying strengths and weaknesses of schemes, comparing schemes across different contexts, and guiding decision-making for future improvements.

Keywords: Composite index, Irrigation scheme performance, Performance assessment

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