



# Methodological Evaluation of Regional Monitoring Networks in South Africa: Cost-Effectiveness Analysis Using Panel Data

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**Published:** 20 October 2000 | **Received:** 17 June 2000 | **Accepted:** 21 September 2000

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**DOI:** [10.5281/zenodo.18712583](https://doi.org/10.5281/zenodo.18712583)

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## Abstract

Regional monitoring networks in South Africa are crucial for assessing agricultural productivity and environmental health. A systematic literature review was conducted to assess methodologies used in regional monitoring networks within South Africa. Panel data analysis will be employed to estimate cost-effectiveness parameters. The review identified that the majority of studies use linear regression models, with significant variability in estimated costs and benefits across different regions. Panel data analysis revealed that incorporating robust standard errors enhances the reliability of cost-effectiveness estimates for monitoring networks. Future research should prioritise the validation of methodological assumptions through empirical testing to ensure accurate cost-effectiveness assessments. The empirical specification follows  $Y = \beta_{0+\beta} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *African geography, panel data, econometrics, agricultural productivity, environmental health, cost-benefit analysis, spatial statistics*

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