



Spectral Methods and Condition Number Analysis for Agricultural Yield Prediction Using Partial Differential Equations in South Africa: A Theoretical Framework Approach

Sipho Mkhize¹

¹ University of Cape Town

Published: 11 January 2001 | **Received:** 15 November 2000 | **Accepted:** 20 December 2000

Correspondence: smkhize@gmail.com

DOI: [10.5281/zenodo.18730311](https://doi.org/10.5281/zenodo.18730311)

Author notes

Sipho Mkhize is affiliated with University of Cape Town and focuses on Mathematics research in Africa.

Abstract

This article explores the application of partial differential equations (PDEs) to predict agricultural yields in South Africa, focusing on spectral methods and condition-number analysis as theoretical frameworks. Spectral methods will be employed to solve PDEs arising from models describing agricultural systems, with a focus on local climate conditions affecting yield. Condition-number analysis will be used to assess the sensitivity and stability of solutions to changes in model parameters. This theoretical framework provides a foundation for future research into more complex agricultural yield prediction models in South Africa, leveraging the benefits of PDEs and advanced numerical techniques. Further empirical validation is recommended using real-world data from South African agricultural regions to validate the model's predictive accuracy under varying climatic conditions. Under standard regularity and boundary assumptions, the forecast state is modelled by $\text{partial}t u(t, x) = \kappa \partial^2 u(t, x) + f(t, x)$, and stability follows from bounded perturbations.

Keywords: *Sub-Saharan, PDEs, spectral methods, conditioning, eigenvalues, stability analysis, boundary value problems*

ABSTRACT-ONLY PUBLICATION

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

✉ **REQUEST FULL PAPER**

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge