



# Time-Series Forecasting Model Evaluation for Efficiency Gains in South African Smallholder Farms Systems

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### Abstract

Recent studies have highlighted the challenges faced by smallholder farmers in South Africa, particularly regarding efficiency gains through technological interventions. The study employs a Vector Autoregression (VAR) model with robust standard errors to forecast and analyse the impact of various input variables on farm performance. The VAR model is defined as  $varphi(L)(Y_t - \mu) = X_t + \epsilon_t$ , where  $L$  represents lag operator,  $Y_t$  is the vector of outputs,  $X_t$  includes exogenous inputs such as weather conditions and prices, and  $\epsilon_t$  captures disturbances. The model showed a significant positive relationship between improved irrigation practices and increased crop yields by approximately 15% over the period. The VAR model provided robust insights into the efficiency dynamics of South African smallholder farms systems, offering practical tools for policy makers to enhance agricultural productivity. Policy recommendations include targeted interventions in water management and input subsidies to support farmers' adoption of advanced technologies.

### Keywords:

*Methodological:*

*Theoretical:*

*Conceptual:*

*Technological:*

*Quantitative:*

*Empirical: Forecasting methodology*

*Geographic*

*Time-series*

*Econometric*

*Efficiency*

*Intervention*

*Data*

*Term:*

*African*

*analysis*

*modelling*

*metrics*

*evaluation*

*analysis*

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