



IoT Sensors in Precision Farming: Adoption Trends in Zimbabwe's Commercial Agriculture

Chisomo Moyo¹

¹ University of Zimbabwe, Harare

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Correspondence: cmoyo@aol.com

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Author notes

Chisomo Moyo is affiliated with University of Zimbabwe, Harare and focuses on Computer Science research in Africa.

Abstract

Precision farming utilizes IoT (Internet of Things) sensors to monitor soil moisture, temperature, and other environmental factors at various points across a farm. In Zimbabwe's commercial agriculture sector, there is increasing interest in adopting such technologies for better crop yields and resource management. A mixed-methods approach was employed, combining quantitative data from surveys with qualitative insights from interviews. Data were collected from a representative sample of farms across different regions in Zimbabwe. The survey revealed that approximately 35% of surveyed farmers have implemented IoT sensors for monitoring soil moisture and temperature, with significant variation by region and farm size. While the overall adoption rate is moderate, there are notable differences among regions and farms based on their resources and technological infrastructure. Incentive programmes should be designed to encourage smallholder farmers in less developed areas to adopt IoT sensors for precision farming. Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{Vert}^2$, with performance evaluated using out-of-sample error.

Keywords: *Geographical Information Systems (GIS), Precision Agriculture, Remote Sensing, Data Mining, Machine Learning, Geographic Coordinates, Sensor Networks*

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