



Enhancing Food Security in Sub-Saharan Africa Using IoT and Smart Farming Technologies

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Introduction

Food security remains a pressing issue in Sub-Saharan Africa, where the combination of climate change, rapid population growth, and outdated farming practices create an unfavourable situation for sustainable food production. Traditional farming methods, which are often affected by poor resource management and labor-intensive practices, struggle to meet the demand for the increased productivity. Recently, the advent of Internet of Things (IoT) and smart farming technologies has made it possible for innovations to be made to transform these agricultural practices. IoT devices enable real-time monitoring of soil moisture, temperature, and crop health; automated irrigation systems reduce water wastage; and advanced sensor networks detect pest early, making it possible for precision agriculture. For example, comparative research by Smith et al. (2022) illustrates how government-supported policies facilitate technology dissemination, while Olawale & Mensah (2021) emphasize the critical role of digital literacy among local farmers. Furthermore, studies such as “Smart Farming Technologies for Sustainable Agriculture” and “A Roadmap for Intelligent Agriculture in Africa” delve into adoption strategies and infrastructural challenges. This paper aims to create these perspectives, assess the current benefits, and identify future paths for IoT adoption to secure a more buoyant food system in SSA.

Materials and Methods

This review is based on a methodical analysis of the literature, extracting from peer-reviewed journals, technical reports, and empirical case studies that capture the growing landscape of IoT-enabled agriculture in Sub-Saharan Africa. The Methodology consists;

- Literature Review: Selection of relevant studies focused on IoT applications, including precision farming, automated irrigation, wireless sensor-based monitoring, and AI-driven pest management.

Results and Discussion

The incorporation of smart farming technologies is producing promising improvements across many key agricultural metrics. The following table summarizes the primary impacts observed in the literature.

The comparative review of studies shows that while the benefits are clear; such as improved yields, water efficiency, and lower operational costs, pressing issues remain. High infrastructure costs and a lack of vigorous digital training programs limits many smallholder farmers from fully enjoying these benefits. Research focusing on policy frameworks and collaborative initiatives, as seen in “A Roadmap for Intelligent Agriculture in Africa,” shows that when governments, private enterprises, and technology providers join collaborate, these challenges can be effectively reduced.

Furthermore, an in-depth analysis of both quantitative and qualitative data from the reviewed papers shows that targeted interventions, such as subsidised IoT solutions and localized training workshops, could hasten adoption and ultimately boost food security across Sub-Saharan Africa.

Conclusions

IoT and smart farming technologies have transformative potential for enhancing food security in Sub-Saharan Africa. Harnessing innovations such as real-time monitoring, automated control systems, and predictive analytics it makes it possible to realize notable improvements in agricultural productivity, resource efficiency, and cost management. However, to fully enjoy these benefits, it is important to tackle the existing issues related to infrastructure, affordability, and digital literacy.

Keywords

IoT, Smart Farming, Food Security, Precision Agriculture, Sub-Saharan Africa, Sustainable Agriculture