



## Climate change, soil health, and governance challenges in Ghana: A review

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### ABSTRACT

Climate change poses significant challenges to soil health and agricultural productivity in Ghana, with implications for similar contexts worldwide. This review synthesises existing knowledge on the impacts of climate change on soil properties across Ghana's diverse agro-ecological zones, examines the effectiveness of current governance responses through an adaptive governance lens, and identifies critical research and policy gaps. Ghana provides an instructive case study because of its diverse agroecological zones, agriculture-dependent economy, and dual governance systems that combine formal institutions with traditional authorities. The study employs a comprehensive literature search across multiple databases, qualitative synthesis methods, and conceptual frameworks to analyse the complex interactions between climate factors, soil health parameters, and governance structures. Key findings reveal that increasing temperatures and erratic rainfall patterns contribute to soil moisture depletion, organic matter loss, and reduced fertility. Ghana's soil health governance faces limitations due to policy fragmentation, resource constraints, and insufficient stakeholder collaboration. Successful case studies highlight the potential of integrating traditional knowledge with modern soil conservation practices and emphasize the importance of community-driven approaches. From the review, it is recommended that a comprehensive national soil health policy aligned with climate adaptation strategies be developed, institutional capacity be strengthened, and participatory governance mechanisms be promoted. The findings contribute to a broader understanding of environmental governance under climate change, with relevance to international frameworks including the Sustainable Development Goals and the Global Soil Partnership. Addressing identified research gaps and implementing the proposed adaptive governance framework are crucial for enhancing resilience to climate change impacts on soil health in Ghana and other regions facing similar challenges.

### 1. Introduction

Climate change poses one of the most significant threats to global soil resources and agricultural systems in the 21st century. Rising temperatures, changing precipitation patterns, and increasing frequency of extreme weather events are altering fundamental soil properties and functions worldwide. Global assessments indicate that climate change is accelerating soil degradation through increased erosion, reduced organic matter content, altered microbial communities, and disrupted nutrient cycling (FAO, 2023). These impacts vary regionally but

collectively threaten agricultural productivity, food security, and ecosystem services across diverse landscapes. The Intergovernmental Panel on Climate Change estimates that 25–30% of global land areas are already affected by soil degradation, with climate change expected to exacerbate these trends (Singh, 2023). Maintaining soil health under changing climate conditions has therefore emerged as a critical challenge requiring integrated governance approaches that span multiple sectors and scales.

In this review, soil health is defined as "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and

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