



Tropentag, September 16-18, 2026, hybrid conference

“Towards multi-functional agro-ecosystems
promoting climate resilient futures”

The role of climate information in enhancing household food security in rural northern Ghana

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Abstract

Climate variability continues to undermine agricultural productivity and household food security in the global south, where smallholder agriculture is predominantly rainfed. Particularly, agriculture in Ghana is highly vulnerable to climate variability, with erratic rainfall, prolonged dry spells, and rising temperatures posing persistent threats to crop production and household food security. Climate Information Services (CIS), including seasonal forecasts, rainfall advisories, and weather warnings, have emerged as critical tools for helping farmers anticipate climate conditions and make informed decisions. Access to timely and reliable climate information is therefore increasingly recognised as an essential component of climate smart agriculture and rural resilience. Despite growing investments in CIS dissemination, there is limited empirical evidence to identify factors shaping household access to climate information, and the pathways through which such information affects yield, food consumption, and food access. Using cross-sectional survey data from 2,934 farm households in rural northern Ghana, the probit model was estimated to identify determinants of households' CIS access, and the mediation framework was applied to trace direct and indirect effects of CIS on food security via yield. Food security was measured using the food consumption score and the household food insecurity access scale. The study reveals that male-headed households, extension access, larger households, literacy, ownership of phones and radios, higher asset levels, and perceptions of increased temperature and reduced rainfall significantly increase the probability of accessing CIS. Regional dummies reveal substantial spatial inequalities, with households in the Northeast and Upper West significantly less likely to access CIS. The mediation estimate reveals that CIS significantly increases FCS by approximately 21 % and reduces HFIAS by about 10 %. Therefore, the study concludes that CIS is an effective resilience-building tool that improves both farm productivity and household food security. It recommends expanding extension services, mobile-based CIS delivery, and prioritising underserved locations to maximise the benefits of climate information for vulnerable farming households.

Keywords: Causal mediation analysis, climate information, food security, socioeconomic factors