Adoption Dynamics of Precision Agriculture Technologies Among Northern Ugandan Smallholder Farmers: A Replication Study

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Abstract

{ "background": "Precision agriculture technologies (PATs), including GPS-guided tractors, drone-based crop monitoring, and precision irrigation systems, have shown promise in enhancing agricultural productivity and sustainability among smallholder farmers globally. However, their adoption rates vary significantly across different regions and contexts.", "purposeandobjectives": "This replication study aims to re-examine the adoption dynamics of PATs among Northern Ugandan smallholder farmers using a similar methodology as the original study but with updated data collection methods. The objectives are to assess current trends in technology uptake, identify barriers to adoption, and explore potential pathways for increased diffusion.", "methodology": "The study employed a mixed-method approach combining quantitative surveys ($n=300$) $\wedge$ $qualitative\ interviews$ $(n=50)$. Data were collected through structured questionnaires assessing farmers' knowledge, attitudes, and experiences with PATs. Qualitative insights were gathered via in-depth interviews focusing on key factors influencing technology adoption.", "findings": "The findings indicate a moderate adoption rate of 35% for GPS-guided tractors among Northern Ugandan smallholder farmers, while precision irrigation systems had an even lower uptake at 20%. Key barriers include high initial investment costs and perceived technical complexity. Qualitative interviews revealed that perceived benefits such as increased yield stability and reduced water usage were cited as primary motivators.", "conclusion": "The replication study confirms the original findings regarding adoption dynamics of PATs among Northern Ugandan smallholder farmers, highlighting specific trends and barriers to technology uptake. These insights are crucial for developing

targeted policy interventions aimed at increasing access and utilization of these technologies.", "recommendations": "Given the identified challenges, recommendations include subsidizing initial costs through government or private sector partnerships, enhancing farmer training programmes, and promoting community-based support networks to facilitate knowledge sharing and diffusion of PATs.", "keywords": "Precision Agriculture Technologies (PATs), Smallholder Farmers, Northern Uganda, Adoption Dynamics, Replication Study", "contributionstatement": "This replication study contributes by refining our understanding of the

Keywords: *Sub-Saharan, African, methodology, agronomy, technological, socioeconomic, contextualization*

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