

## Abstract

Climate change presents a critical challenge to agricultural systems in Kenya's arid and semi-arid lands (ASALs), where smallholder farmers face recurrent droughts, erratic rainfall, and declining productivity. Climate-Smart Agriculture (CSA) offers a potential pathway to enhance resilience, productivity, and sustainability; however, adoption rates remain low in Mwingi West Sub-County, Kitui County. This study investigated the socio-economic determinants influencing the uptake of climate-smart agricultural practices (CSAPs) among 393 smallholder farmers, employing a cross-sectional survey design, multi-stage sampling, and both quantitative and qualitative methods. Data were analysed using chi-square tests and binary logistic regression. Results revealed that education level, household income (farm and off-farm), gender, and proximity to markets significantly and positively influenced CSA adoption, while larger farm size and younger age were negatively associated with uptake. Educated farmers were 4.36 times, and higher-income farmers 4.58 times, more likely to adopt CSAPs compared to their counterparts. Male farmers were 2.34 times more likely to adopt than female farmers, reflecting persistent resource access disparities. Findings underscore the need for targeted interventions that enhance farmer education, expand financial access, integrate gender-responsive extension services, and promote youth engagement in CSA. These measures are critical to strengthening climate resilience and advancing sustainable agricultural development in climate-stressed regions like Mwingi West.