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Socio-economic determinants of farmer managed natural regeneration (FMNR) adoption among smallholders in semi-arid Kenya

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Abstract

Land degradation threatens ecosystems and rural livelihoods, especially in Africa's drylands. Farmer Managed Natural Regeneration (FMNR) is a low-cost land restoration practice that regenerates trees, improves soil and water retention, and enhances resilience. Yet adoption remains uneven, and its drivers are poorly understood. This study examined determinants of FMNR in semi-arid Baringo County, Kenya, using survey data from 288 smallholder households (145 FMNR adopters and 143 non-FMNR adopters) in different parts of Baringo County. Structured interviews captured demographic, socioeconomic, institutional, and farm-level factors.

Descriptive statistics compared groups, and logistic regression identified adoption predictors. Longer residence strongly increased FMNR adoption, reflecting how tenure security and ecological knowledge encourage long-term restoration. Female-headed households were more likely to adopt ($\beta = -0.665$, $p = 0.043$), while household labour availability, proxied by household size ($\beta = 0.115$, $p = 0.031$) and spousal support ($\beta = 0.171$, $p = 0.002$), was critical. Education of the household head also enhanced uptake. Contrary to portrayals of FMNR as a pro-poor agroforestry practice, adopters were wealthier, suggesting labour and assets drive adoption. Access to extension services was a key predictor of FMNR adoption, underscoring the role of institutional support. FMNR adoption was significantly driven by both on-farm native tree diversity ($\beta = 0.197$, $p = 0.007$) and benefits from non-native trees ($\beta = 0.161$, $p = 0.031$). Overall, FMNR adoption is shaped by tenure security, household labour, education, and extension services. Scaling FMNR to combat land degradation requires government-led extension, support for poorer households, and gender-responsive, locally adapted restoration strategies.

Keywords: Adoption, FMNR, Kenya, land degradation, smallholders, socio-economic determinants