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The potential of farmer-managed natural regeneration for restoration in agricultural landscapes

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Abstract

65 % of Africa's agricultural land is degraded, making restoration more urgent than ever. Farmer-managed natural regeneration (FMNR) is an agroforestry practice where farmers combine naturally regenerating trees with agricultural production. It has received a lot of attention as a cheap and effective way to restore degraded farmland, particularly in Africa. However, we currently do not know what species regenerate in what context and whether this meets needs of farmers.

Mechanistic understanding of natural regeneration comes from studies on ecological succession, which control for human influences. How farmers modify successional processes and what the consequences are for ecosystem functionality is unclear. We systematically compare ecosystem properties across field ages in actively managed FMNR fields and in unmanaged secondary forests in Migori (FMNR maize systems) and Baringo (FMNR grazing systems) counties of Kenya. In addition, interviews with field owners were carried out to understand farmer's individual preferences and needs.

The benefits associated to FMNR are diverse and contain many subsistence needs (firewood, medicine, timber and fodder) underlining its suitability in smallholder landscapes. Compared to unmanaged secondary forests, FMNR maize fields had only a fraction of the tree densities, yet stand basal area (biomass) was about half the biomass of similar-aged secondary forests. FMNR grazing systems tree densities were much larger and could attain biomass values comparable to unmanaged secondary forests, suggesting grazing systems are more compatible with trees than maize cropping systems. Trees are consistently taller in FMNR systems compared to unmanaged systems, indicating that farmers promote height-growth of selected trees, in order to make them more compatible with agricultural production objectives. Species richness in FMNR maize systems was relatively high, given its lowered tree densities, and differ remarkably across different fields, highlighting farmers' autonomy and individual preferences expressed in tree selection. A characteristic that is vital for its upscaling potential.

Farmer managed natural regeneration has great potential to increase tree diversity in smallholder agricultural landscapes both at the field level, and at the landscape level. Understanding where natural regeneration is sufficient to meet subsistence needs and where additional tree planting is required is an important step towards effective restoration planning.

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