Climate-resilient crops for planetary health: Strengthening cowpea, sesame, and sorghum value chains for food systems transformation and land health restoration in Malawi

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Abstract

Global land system changes driven by unsustainable agriculture, deforestation, and climate variability are threatening planetary health by breaching ecological boundaries related to biodiversity, soil integrity, and climate regulation. In Sub-Saharan Africa, over 65% of productive land is degraded, undermining food security and rural livelihoods. Southern Africa, including Malawi, faces increasing climate extremes, with smallholder farmers disproportionately affected due to reliance on rain-fed agriculture and limited adaptive capacity. This study investigates the potential of cowpea, sesame, and sorghum, three climate-resilient crops to contribute to food systems transformation and land health restoration in Malawi's drought-prone districts. These crops were selected for their ecological benefits: cowpea improves soil fertility through nitrogen fixation, sesame thrives in low-input, semi-arid conditions, and sorghum stabilizes soil and enhances water retention. Using a mixed-methods approach, the study combined farmer surveys (n = 1,424), stakeholder interviews, value chain mapping, and policy analysis. Findings reveal that 35–50% of farmers rely on uncertified seeds, informal markets compromise quality and earnings, and land degradation persists due to unsustainable practices. However, sustainable land management practices such as intercropping, agroforestry, and conservation agriculture show promise for restoring soil health and improving yields.

The study concludes that strengthening seed systems, promoting structured markets, and scaling sustainable land practices are essential to unlocking the potential of these crops. Policy recommendations include developing crop-specific strategies, enhancing stakeholder coordination, and integrating land restoration goals into national food systems planning.

Keywords: Agro-processing, climate-smart agriculture, smallholder resilience, value chain development

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