

Economic analysis of intensified and diversified coffee-banana agroecosystems in the Elgon region

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Abstract

This study examined the economic performance of intensified and diversified coffee-banana agroecosystems in Kapchorwa and Sironko districts on the slopes of Mt. Elgon. Specifically, the study classified existing land management systems within the coffee-banana farming system, assessed their technical and economic efficiencies, and examined factors influencing farmers' transition to more sustainable and environmentally acceptable production systems.

The study used Principal Component and Cluster Analysis to identify and classify land management typologies; a Generalised Linear Model to determine factors influencing productivity; a stochastic production frontier model to estimate efficiency; and a Generalised Ordered Logistic Model to assess factors influencing transition between management systems.

study identified four distinct coffee-banana land management systems: **low-input low-output**, characterised by minimal or no external input use; **conventional**, characterised by relatively high use of external inputs; **mildly agroecological**, in which farmers reduced external input use in coffee and banana while applying inputs to diversified, higher-value short-term crops; and **highly agroecological**, characterised by intensive labour use, greater manure application and higher integration of shade trees.

Substantial technical inefficiency was evident, with coffee yield gaps of up to approximately 50% and only 31% of farmers operating above 50% technical efficiency. Mean technical efficiency was highest among highly agroecological farms (56%), followed by mildly agroecological (45%) and conventional systems (38%), indicating considerable scope for improving productivity through better management of agroecological production systems. Adoption and transition between management systems were influenced by access to credit, farm size and livestock ownership, while improved coffee genotypes, manure use and labour intensification were important factors associated with movement towards higher-efficiency systems. Average allocative efficiency among conventional farmers was approximately 73%, ranging from 64% to 80%. Economic efficiency varied substantially, with most farms concentrated between 38% and 45%.

The study concludes that coffee-banana intensification in the Mt. Elgon region need not depend exclusively on conventional input-intensive production. Agroecological systems can provide a viable and potentially competitive pathway for improving productivity while supporting soil fertility management and sustainable land use. The study therefore recommends strengthening agricultural extension around appropriate crop and input combinations, promoting livestock integration and improved manure management, and broadening input-support policies beyond inorganic fertilizer to include manure and livestock where appropriate.

Key words: *Agroecological systems; coffee-banana farming; economic efficiency; land management; Mt. Elgon.*