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Food and Energy Trade-Offs in the Nile River Basin in Ethiopia: A Household-Level Analysis

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Abstract

Smallholder agricultural households in the Ethiopian Nile river basin face considerable trade-offs between semi-subsistence food production, domestic production and collection of energy resources. Competition for land, labour and agricultural inputs results in multiple trade-offs, specifically for the collection and usage of fuelwood, crop straws and livestock manure. Building on the water-energy-food security nexus and non-separable agricultural household decision-making conceptual frameworks, this study used household surveys to analyse these trade-offs. Methodologically, the study applied simultaneous structural equation modelling using a three stage least squares (3sls) estimation. This method captured the simultaneity and endogeneity of household food and energy decisions regarding production and consumption. The results showed that rural Ethiopian agricultural households depend on their own production to meet food and energy needs. When food production rose by 1 %, food consumption increased by 0.15 % and when energy production increased by 1 %, consumption respectively rose 0.22 %; however, there was also an important trade-off effect. When energy production rose by 1%, food production decreased 0.35 %. Similarly, when food production increased 1 %, energy production and consumption decreased 1.17 % and 0.31 % respectively. Although the literature pointed to synergies between food and energy production in Ethiopia when considering labour allocation decisions for individual energy and food activities, this study found significant trade-offs when analysing the full system of food and energy production inputs and activities. For example, agroforestry practices (i.e. planting trees on household plots) reduce labour allocations required for off-farm fuelwood collection and increase labour allocations for food production; however, there is still a trade-off between household resource allocation for food and energy production. These findings suggest that long-term, sustainable solutions to improve energy access and enhance food security require greater investments into developing decentralised energy systems and expanding centralized electricity grid access.

Keywords: Energy security, food security, sub-Saharan Africa, sustainable land management, WEF nexus

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