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Off-farm employment, technical efficiency, and household income in ghana's cocoa sector: A stochastic frontier analysis

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Abstract

Ghana's cocoa industry is confronted with significant production challenges, leading to a persistent decline in national output, lower export earnings, and increasing vulnerability among farm households that rely on cocoa for their livelihoods. As a coping mechanism, many farmers diversify into off-farm income activities. While such diversification may stabilise household income, it also raises questions about its impact on farm productivity.

This study investigated how participation in off-farm employment influences cocoa farmers' technical efficiency and household income. Technical efficiency and its determinants were estimated using Stochastic Frontier Analysis (SFA), while Heckman's two-step procedure was applied to correct for potential selection bias and to test the robustness of the results.

The SFA findings show that farm size, capital, and fertiliser positively affect cocoa output. Factors such as farming experience, off-farm work, FBO membership, extension access, and credit reduced inefficiency. Conversely, farm disasters and farm age increased inefficiency. The average technical efficiency score was 0.824, suggesting farmers operate 17.6 % below the frontier. Notably, farmers who combined cocoa farming with off-farm employment achieved a higher mean efficiency score (0.843) compared to those solely engaged in farming (0.723), indicating a 12 % efficiency gap.

Results from the Heckman selection (probit) model indicate that household size, farming experience, and disasters increase the likelihood of engaging in off-farm work, whereas credit access and farmer age reduce this likelihood. In the outcome equation, predicted off-farm work participation, credit access, and off-farm income positively and significantly improved efficiency, while disaster and farm size reduced efficiency.

On average, farm income accounted for 38.06 % of total household earnings, while off-farm activities contributed 61.94 %. Although engagement in off-farm work appears to enhance both efficiency and income stability, excessive dependence could hinder efforts to revitalize Ghana's cocoa sector.

The study recommends that the Government of Ghana and COCOBOD revise farm gate prices to reflect rising production costs and ensure equitable returns to farmers. A more responsive pricing policy would strengthen income security, reduce the need for off-farm diversification, encourage reinvestment in cocoa farms, and ultimately support higher national output, improved household welfare, and Ghana's continued standing as the world's second-largest cocoa producer.

Keywords: Cocoa, Heckman's Two-Step Model. , Off-farm Employment, Stochastic Frontier Analysis, Technical Efficiency

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