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Bridging supply- and demand-side stated preferences for designing sustainable youth-led aquaculture business models: evidence from northern Ghana

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Abstract

Northern Ghana faces persistent youth underemployment and seasonal food insecurity, particularly during the dry season when agricultural opportunities are limited by a unimodal rainfall regime. Despite the presence of over 2,000 small community reservoirs constructed primarily for irrigation, their potential for aquaculture remains largely under-utilised. While recent pilots demonstrate the technical feasibility of cage aquaculture, the economic and institutional sustainability of existing project-driven models, often reliant on capital subsidies and limited technical training, remains uncertain, compounded by challenges related to governance, property rights, and power dynamics.

This paper examines how aquaculture in small reservoirs can be developed into a viable, inclusive, and scalable economic activity. We propose and empirically implement a sequential framework that integrates technical piloting, business model co-creation, and ex ante economic assessment, explicitly incorporating community preferences into the design process. Using primary data from Northern Ghana, we combine stakeholder-informed business model design with two discrete choice experiments (DCEs), each administered to approximately 500 households. The first (supply-side) DCE elicits preferences over alternative aquaculture arrangements, including employment modalities, payment structures, contract duration, market orientation, and community benefits. The second (demand-side) DCE captures consumer preferences for fish attributes such as species, product form, size, and price.

Results show that community acceptance is strongly driven by tangible local benefits. Providing salaried employment reduces the compensation required for project acceptance by approximately USD 2,610 annually, while profit-sharing arrangements reduce it by about USD 1,870. Local market access further enhances acceptance, whereas contract duration has no significant effect. On the demand side, consumers exhibit a willingness to pay premiums for catfish, smaller-sized fish, and smoked products, with substantial heterogeneity across preferences.

The study contributes methodologically by integrating pilot-based validation with stated-preference approaches for business model design. Substantively, it highlights the importance

of employment generation and localised value chains in fostering socially acceptable aquaculture systems. The findings offer policy-relevant insights into leveraging small-scale water infrastructure to promote youth employment, attract private investment, and support agri-food system diversification in Sub-Saharan Africa.

Keywords: Aquaculture, common-pool resources, discrete choice experiments, small reservoirs, youth employment