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Sustainable Aquaculture for a Secure Future

Title: Optimizing Tilapia, *Oreochromis* sp., Marketing Strategies in Nicaragua: A Mixed-integer Transshipment Model Analysis

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Abstract: Tilapia, *Oreochromis* sp., production has increased in the Central American region in recent years. Yet, commercial tilapia aquaculture has not developed in Nicaragua on the scale that it has in other neighboring countries. Although demand for tilapia products exists, lack of thorough understanding of domestic markets and coordinated production and marketing efforts have hampered the development of a domestic market. The objectives of this study were to quantify domestic marketing costs for tilapia produced in Nicaragua and develop a mixed-integer transshipment mathematical programming model to identify the most profitable marketing alternatives for tilapia farmers. Results suggested targeting primarily outlets with higher sales prices such as restaurants with supplemental production delivered to local supermarkets. The model chooses cities with weekly restaurant demand capable of absorbing the farm's production with excess product sold to alternative outlets. Supply of farm-raised tilapia production in most regions of Nicaragua was insufficient and created problems associated with frequent and dependable deliveries required by higher paying outlets (restaurants and supermarkets). Larger farms will generate greater returns with regular consistent deliveries to higher priced restaurant outlets. Smaller farms with limited production volumes were not able to meet weekly delivery requirements. Biannual deliveries reduced transportation cost and sales price and were not profitable. However, sustaining markets with infrequent deliveries may not be feasible. This analysis provides guidelines for targeting those specific markets that optimize returns to specific farm sizes in specific regions.

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