

FROM HARVEST TO PLATE: AN ANALYSIS OF THE AQUACULTURE POSTHARVEST CHAIN IN NIGERIA

To support Nigeria's fish-sector development, the Feed the Future Innovation Lab for Fish managed by Mississippi State University awarded the Quick Start project From Harvest to Plate: An Analysis of the Aquaculture Postharvest Chain in Nigeria, a project that aimed to improve the contribution of aquaculture fish to the diet and household incomes of the Nigerian people, including poor and vulnerable women and children. The goal of the project was to conduct a comprehensive analysis of the aquaculture postharvest chain of Nigeria to better understand the fate of harvested fish from production to consumption. The Quick Start project was jointly implemented by Mississippi State University, Washington University in St. Louis, and WorldFish.



Woman with fish harvest. Joe Steensma/WUSTL

POSTHARVEST VALUE CHAIN STRUCTURE

Fieldwork revealed that postharvest aquaculture value chains in Nigeria were short and simple, though there were variations in value-chain configuration and coordination among studied states. Value chains in states with more aquaculture production, such as Lagos, Ogun, Delta, and Rivers, had a higher level of complexity than those with less aquaculture production. In all states, value-chain actors had limited cold-storage facilities. From farm to fork, aquaculture fish products were marketed and sold in different forms, including live fish, fresh fish, and smoked fish. Given the poor infrastructure for transportation and limited electricity supply, value-chain actors kept products for a short duration then sold to next actors.

POSTHARVEST LOSS ALONG AQUACULTURE VALUE CHAINS

In Nigeria, where access to electricity and a cold chain can be an issue, fish losses can be significant. Postharvest losses can be due to mishandling and contamination during transporting, storing, processing, and waiting at markets to be sold. This study showed that total fish losses in Nigeria overall were surprisingly low (less than 2%). Fish losses from small-scale aquaculture were slightly higher than losses from large-scale aquaculture for both catfish and tilapia. For small-scale aquaculture, catfish losses were lower than for tilapia mainly because catfish has a higher tolerance to space and water-quality constraints during transportation and can be sold live in the market.

CHARACTERISTICS OF AQUACULTURE PRODUCTION SYSTEMS IN NIGERIA

The most common aquaculture systems used by smallholder aquaculture farmers were earthen ponds (58%), concrete tanks (38%), fiber-plastic tanks (12%), and tarpaulin tanks (15%). Collapsible ponds, cage aquaculture, flow-through raceways, recirculating aquaculture systems, and burrow pits were other production facilities in use. Our analysis showed that aquaculture production systems operated by smallholders were characterized by small production facilities.

To assess economic performance, the team conducted a **benefit-cost analysis of catfish** aquaculture practiced by small farmers in Nigeria in major production systems. The results of this analysis suggested earthen ponds had higher

PROJECT TEAM

Nigeria PI	Nhuong Tran, PhD WorldFish
U.S. PI	Julius A. Nukpezah, PhD Mississippi State University
U.S. co-PI	Joseph Steensma, EdD Washington University in St. Louis

profitability (1.75) followed by concrete tanks (1.62) and other production systems (1.56). On average, for each dollar of investment, farmers got back 0.64 dollars (\$0.64) gross margin. Due to low operation costs, earthen ponds had the highest benefit-cost ratio compared to concrete tanks and other production facilities.

In terms of **benefit-cost analysis of tilapia** aquaculture performance was poor, with an average of 1.17 for the whole sample and 1.09 for earthen ponds. Other production facilities experienced a negative net return and resulted in a benefit-cost ratio of 0.55. There are several important implications for tilapia aquaculture assessment. First, it is not a popular aquaculture species in Nigeria. Only 19 of 648 surveyed farmers reported farming tilapia in 2018. Second, tilapia was included as a species in polyculture with catfish, and the production objective likely was to provide feed to catfish. In other words, aquaculture farmers in the

surveyed sample may not pay equal attention to tilapia as to catfish.

AQUACULTURE CONTRIBUTIONS TO RURAL LIVELIHOODS AND HOUSEHOLD INCOMES

High demand for fish was one of the important motivations for farmers to engage in aquaculture production. However, the most important factors influencing farmers' decisions to start aquaculture operations were other farmers' success and profitability. This study showed that aquaculture is a profitable activity that can contribute to household income. More than 75% of survey respondents contributed more than half of their household's income. However, there were only 25% of respondents who focused on aquaculture as the only livelihood/income-generating activity. In addition to aquaculture, farmers also engaged in other businesses, agriculture production (mainly crop farming), and trading.

WOMEN AND YOUTH ENGAGEMENT IN AQUACULTURE

Results indicated gendered roles in aquaculture value chains in Nigeria. For example, men were more likely to participate in aquaculture production and processing activities while women were more active in trading, wholesaling, and retailing activities. The top challenges faced by women included cultural barriers, lack of capital and difficulty accessing financial resources, low risk-taking attitudes of women, and poor infrastructure. Lack of technical knowledge was also commonly found to constrain women's engagement in aquaculture-related livelihood activities.

GAPS IN THE AQUACULTURE POSTHARVEST SECTOR IN NIGERIA

Through this investigation, gaps in understanding of the aquaculture postharvest value chain have been filled. Postharvest losses are not as pronounced as what might otherwise have been presumed, and the overall efficiency of the aquaculture sector is not as profoundly impacted by postharvest losses as was originally hypothesized. This study demonstrates potential opportunities for greater investment in training and technical-skill development among women and youth to improve postharvest value. Further, it demonstrates that catfish—due to its hardiness and variety of preparations—has less postharvest loss than tilapia (though both species have low postharvest loss). Overall, growth in demand and increasing competition should continue to drive efficiency within the value chain, including postharvest activities.

ABOUT THE FISH INNOVATION LAB

The Fish Innovation Lab supports the United States Agency for International Development's agricultural research and capacity building work under Feed the Future, the U.S. Government's global hunger and food security initiative. Mississippi State University is the program's management entity. The University of Rhode Island, Texas State University, Washington University in St. Louis, and RTI International serve as management partners.

www.feedthefuture.gov
www.fishinnovationlab.msstate.edu

This summary was made possible by the generous support of the American people through the U.S. Agency for International Development (USAID) under the Feed the Future initiative. The contents are the responsibility of the Feed the Future Innovation Lab for Fish and do not necessarily reflect the views of USAID or the United States Government.