



Fish Waste Valorization for Sustainable Animal Feed Production: A Comprehensive Review

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Globally, fish production reached 223.2 million tons in 2022, with Sri Lanka contributing approximately 530,000 metric tons of production annually. However, the fisheries sector faces inefficiencies across the value chain, with postharvest losses estimated at 40–60%, corresponding to 200,000–300,000 metric tons of wasted fish biomass annually, causing both economic losses and environmental burdens. Concurrently, livestock producers face high feed costs, accounting for 60–70% of total production expenses. Sri Lanka imported USD 51.6 million worth of feed ingredients in 2023 due to domestic shortages. Converting underutilized fish waste into nutrient-rich animal feed offers a dual opportunity to reduce waste and lower feed costs. Using 25% of the monthly fish waste could potentially yield approximately 118–120 tons of animal feed per month. Processed fish-waste-based feed has been shown to achieve crude protein levels of 54–57%, lipids 12–17%, calcium 6–9%, and phosphorus 3–5%, depending on composition and processing method, demonstrating the feasibility of converting waste into high-quality feed. This review synthesizes peer-reviewed literature (2000–2025) retrieved from major academic databases to evaluate the potential of converting fish waste into animal feed. Technologies including traditional fishmeal and oil production, chemical and biological silage, novel physiochemical and enzymatic hydrolysis, and advanced ensiling methods have been reported for their efficacy and nutritional outcomes. Fish-waste-based animal feeds have been shown to enhance livestock performance, providing high-quality protein and omega-3 fatty acids. Key challenges include production limitations, product safety, and scalability feasibility. This review highlights future research directions for the circular economy and emphasizes the development of fish waste-based animal feed under the “waste-to-wealth” concept. Overall, valorizing fish waste represents a viable and sustainable pathway to reduce environmental pollution, reduce feed import dependency, and improve resource efficiency in the animal feed sector.

Keywords: Animal feed, Circular bioeconomy, Fish waste, Sustainability, Waste valorization