

Research Insight

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Effects of Different Feeding Strategies on the Production Performance of Pacific White Shrimp

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Abstract Pacific white shrimp (*Litopenaeus vannamei*) is one of the most economically important aquaculture species worldwide, and feed management plays a crucial role in determining production efficiency and profitability. Different feeding strategies can significantly influence shrimp growth performance, feed utilization, water quality, and overall economic returns. This paper reviews the nutritional requirements and feeding characteristics of Pacific white shrimp and systematically evaluates the effects of various feeding strategies, including fixed-time and fixed-quantity feeding, multiple small-meal feeding, and intelligent precision feeding. The impacts of these strategies on growth rate, survival rate, feed conversion ratio, environmental conditions, and disease management are analyzed. In addition, their economic implications, such as feed costs, production efficiency, and return on investment, are discussed. A comparative case study is presented to illustrate the practical performance of different feeding approaches in commercial shrimp farming systems. The findings indicate that optimized feeding management can improve feed utilization efficiency, enhance shrimp health, reduce environmental impacts, and increase farm profitability. Furthermore, the integration of intelligent feeding technologies offers promising opportunities for sustainable and precision aquaculture. This review provides valuable insights for researchers, aquaculture practitioners, and policymakers seeking to improve the productivity and sustainability of Pacific white shrimp farming.

Keywords Pacific white shrimp; Feeding strategy; Feed utilization efficiency; Aquaculture economics; Precision feeding technology

1 Introduction

The Pacific white shrimp *Litopenaeus vannamei* has become the dominant farmed crustacean worldwide and a cornerstone of the global seafood market, contributing a large share of aquaculture production and animal protein supply. Its commercial success is driven by fast growth, high survival, and tolerance to a wide range of environmental conditions and high stocking densities, making it attractive for intensive and super-intensive systems in both coastal and inland areas (Qiao et al., 2023). At the farm level, intensive pond and tank operations routinely achieve several thousand kilograms per hectare per cycle with favorable financial indicators, highlighting the strong economic potential of this industry when production is efficiently managed (Farkan et al., 2024).

Despite these advantages, the sustainability and profitability of *L. vannamei* culture are tightly constrained by feed costs and feeding efficiency. Feed typically accounts for more than half of the operating or variable costs in shrimp farming, and in some cases approaches 60%-68% of total variable expenses. Surveys of commercial farms similarly show that large feed inputs and resulting feed conversion ratios are key determinants of economic performance, with higher FCRs negatively affecting farm profitability. Beyond economics, excessive feed inputs are a primary source of nutrient loading, deteriorating water quality and generating nitrogen and phosphorus-rich effluents that accumulate in pond water and sediments, increasing environmental risks and reducing long-term sustainability. Consequently, optimizing feed use is central not only to reducing production costs, but also to improving ecological performance and resource efficiency in intensive shrimp aquaculture (Chaikaew et al., 2019; Da Silva et al., 2023).

Within this context, feeding strategy—encompassing ration level, feeding frequency, delivery method, and integration with natural food or biofloc—has emerged as a critical lever for improving production performance of Pacific white shrimp. Evidence from pond and tank trials under semi-intensive and intensive conditions shows that modifying feed amounts, frequencies, or the use of automatic and demand-feeding systems can significantly alter