

Dynamics of the Shrimp Industry in Sri Lanka's Northwestern Province: Current Status, Cyclone Ditwah Impacts and Comparative Culture Practices

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Shrimp aquaculture is an important contributor to global seafood production and rural livelihoods, particularly in developing coastal regions. In Sri Lanka, the Northwestern Province serves as the primary hub for shrimp farming, with production largely focusing on *Litopenaeus vannamei* due to its high productivity and adaptability. However, recent cyclone disruptions and a lack of comparative studies on culture systems have left critical gaps in understanding farm performance. The study aimed to assess the dynamics of shrimp farms along the Puttalam coastal belt with two objectives; first, examining operational, socio-economic, and production characteristics of shrimp industry using structured interviews (n=30, random selection), including assessment of cyclone Ditwah related impacts, and second, to compare the performance of earthen and plastic-lined pond culture systems through a field-based comparative study using three earthen ponds and three plastic-lined ponds to evaluate growth rate, feed conversion ratio, productivity, and water quality parameters. The collected data were analysed using ANOVA to compare production performance and water quality between pond systems, while regression analysis was used to evaluate factors influencing farmer satisfaction. Eighty percent of farms surveyed incurred significant economic losses due to cyclone damage, predominantly affecting stock and feed inventories. Plastic-lined ponds demonstrated significantly superior performance, with higher survival rates ($87.3 \pm 4.4\%$ vs. $61.3 \pm 6.1\%$), improved FCR (1.08 ± 0.11 vs. 1.63 ± 0.16), and greater productivity (5016 ± 502 kg/ha vs. 2999 ± 300 kg/ha) compared to earthen ponds under similar culture durations. Water quality parameters, particularly pH and *Vibrio* concentrations, showed significant associations with production outcomes ($p < 0.05$). In the macro-level survey, socio-economic analysis revealed strong dependence on shrimp aquaculture with limited adoption of technologies such as automated feeding and water quality sensors. Farm size, scale, and technology adoption significantly influenced farmer satisfaction with institutional support ($p < 0.05$). In the micro-level study, plastic-lined ponds showed significantly better performance than earthen ponds. The results offer evidence-based guidance for farm management optimisation, climate adaptation strategies, and policy frameworks aimed at the sustainable development of shrimp aquaculture in Sri Lanka.

Keywords: *Shrimp farming, Cyclone Ditwah, Climate resilience, Culture systems*