



The Pacific White Shrimp are raised intensively using bore water in Alluru Village, Andhra Pradesh

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Abstract

The culture was conducted in three ponds, each sized 0.4, 0.4 and 0.4 hectares in Alluru village, Bapatla District, Andhrapradesh, an intensive culture system was selected under bore water circumstances. Sy aqua seed was collected from Saptagiri Hatcheries; the *L. vannamei* seed was provided from the CAA-certified Venkatanagaram Visakhapatnam District, Andhra Pradesh. The stocking densities of *L. vannamei* PL₁₀ (post larvae) were calculated using three samples, each of which had 50, 50 and 50 species/m² and 80%, 75, and 82% survival rates. The artificial diet was provided 4times/day with 35-40% protein. During the summer months of March through June, the water quality parameters were checked every fortnightly at 7 a.m. The final growth was 22.30, 22.70 and 22.50g; ADG 0.20, 0.21 and 0.21g; production was 3568, 3405, and 3690kg; feed was 4550, 4600, and 4800kg; FCR was 1.27, 1.35, and 1.30 for Pond A5, Pond B5, and Pond C5/107 days, respectively.

Keywords: *L. vannamei*, salinity, dissolved oxygen, growth, production, and economic analysis

Introduction

Aquaculture is one of the most important pillars of food security. In 2020, 87.5 million tons of aquatic animals valued at USD 281.5 million were produced to suit human requirements (FAO, 2022). The industry's output has grown by almost 600% since 1990 (Ahmed and Turchini, 2021)^[1]. *Penaeus vannamei* (Boone) is the dominant species of shrimp, and the culture is done in earthen ponds. It accounted for 10.5% of all aquaculture production, with production levels ranging from 2973 tons in 2016 to 2200 tons in 2020 and 1509 tons in 2023. (FAO, 2025) About 0.3 million individuals in our nation are directly employed by shrimp farming, while 0.6 to 0.7 million people are employed by ancillary businesses. (Unnithan, 2006)^[12]. According to statistics on shrimp farming in India, the state of Andhra Pradesh has the greatest *vannamei* agricultural area. More than half of the nation's shrimp are grown in Andhra Pradesh, which also has a lot of potential for exporting unused waste land. India's fifth-largest state is Andhra Pradesh. In terms of shrimp production and consumption, Andhra Pradesh is regarded as a significant state. Farmers in Andhra Pradesh are turning to innovative methods, such as aqua culture ponds, to address the issue of food production because of the high cost of cultivation and

agricultural techniques, as well as commercialism and consumption strategies. (Chittem, P. B., & Kunda, S. K.2018)^[2].

Methods

The current investigation was carried out over the summer in coastal areas. The Alluru village in the Bapatla district is where the cultural ponds first appeared. The Saptagiri hatchery in Venkatanagaram, Visakhapatnam district, provided the Sy aqua seed used in the study. The months of March through May are when the prawn culture takes place. Bore water cultivation and rectangular ponds. The ponds' density, survival, growth, productivity, and water quality characteristics were also investigated. The larvae are fed four times a day, at six in the morning, ten in the morning, two in the afternoon, and six in the evening. The feed pellet, starter, grower, finisher, and Pro feed type's No. 1, No. 2, 2P, 2SP, 3P, 3SP, 4S, and 4M with 35-40% protein was employed in the artificial diet. Seed costs 0.35 rupees each piece, while feed purchase costs Rs 85 per kilogram.

Statistical analysis: The statistical analysis an "ANOVA" test was applied for the study.

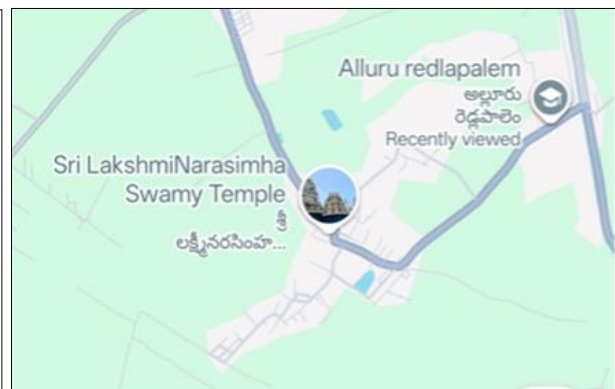


Fig 1: Location map of the study area (Alluru village, Bapatla district)

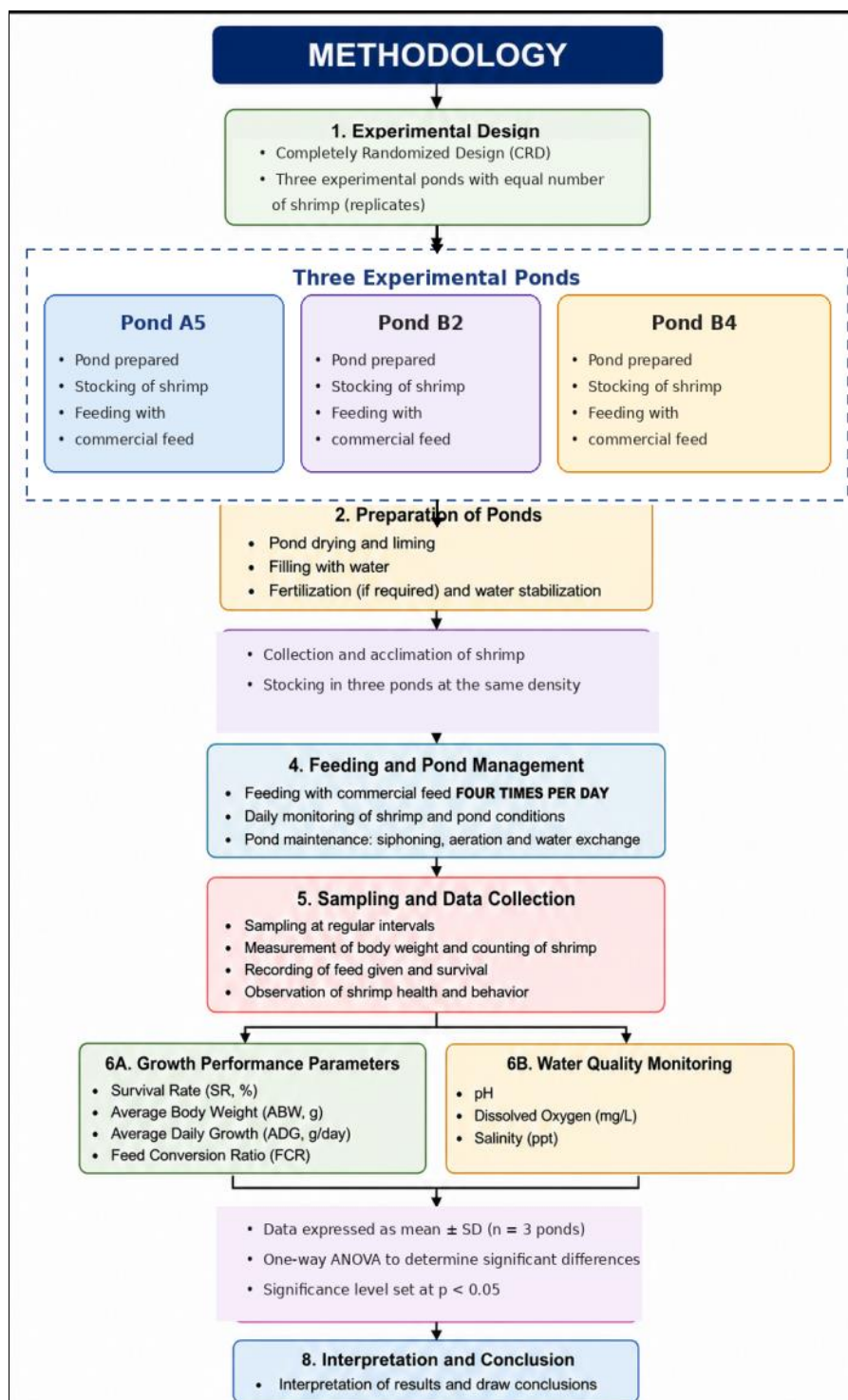


Fig 2: Shows methodology frame work

Results

The *L. vannamei* in Ponds A5, B5, and C5, each of which has a 0.4-hectare water-spread area. With a 107-day culture period, all ponds were supplied on February 3, 2026, and harvested on June 16, 2026. 50 shrimp per square meter was the stocking density.

1. Water-quality parameters: pH, salinity, and dissolved oxygen (DO) readings at various cultivation days are displayed in the water-quality tables. The pH of Pond A5 rose from 7.6 ± 2 on day 1 to 8.2 ± 2 on day 107. DO rose from 4.6 to 5.0 ppm, while salinity rose from 20.0 ± 2 ppt to 25.0 ± 2 ppt. During the culture period, Pond B5

2. had increases in pH from 7.5 ± 2 to 8.2 ± 2 , salinity from 20.5 ± 2 to 25.0 ± 2 ppt, and DO from 4.5 to 5.0 ppm. Pond C5 saw increases in pH from 7.6 ± 2 to 8.2 ± 2 , salinity from 21.0 ± 2 to 25.0 ± 2 ppt, and DO from 4.6 to 5.0 ppm.

3. Growth performance and survival rate: In A5, B5, and C5, the survival rates were 80%, 75%, and 82%, respectively. The average body weight was between 22.30 and 22.70 g, while the harvest size was between 44 and 45 count. 4,550 kg, 4,600 kg, and 4,800 kg of feed were utilized in total. A5 produced 3,568 kg, B5 produced 3,405 kg, and C5 produced 3,690 kg.

4. Production performance and Profit: Pond B5 had the largest net profit (Rs 306,450) and the highest profit per kilogram (Rs 90), whereas Pond C5 had the most production (3,690 kg).

At Rs 1,070,100, Pond C5 earned the largest gross profit. Out of the three ponds, Pond A5 had the lowest feed need in relation to production, with the best FCR (1.27).

Table 1: Water quality parameters (Pond A5)

DOC	P ^H (ppm)	Salinity (ppt)	DO (ppm)
1	7.6±2	20.0±2	4.6
15	7.6±2	20.0±2	4.6
30	7.8±2	21.0±2	4.7
45	7.9±2	22.0±2	4.7
60	8.0±2	23.0±2	4.8
75	8.0±2	23.0±2	4.8
90	8.1±2	24.0±2	4.9
107	8.2±2	25.0±2	5.0

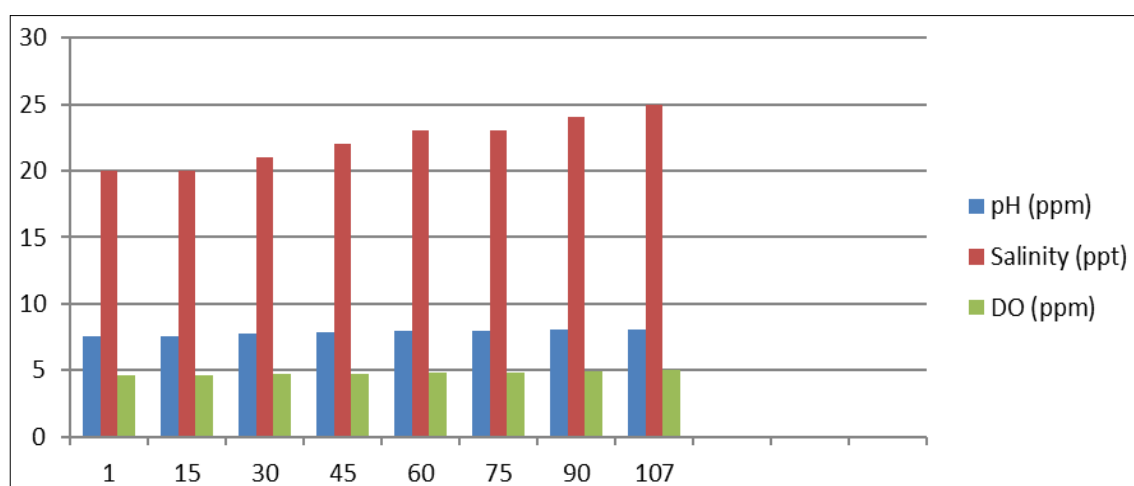


Fig 3: Water quality parameters (Pond A5)

Table 2: Water quality parameters (Pond B5)

DOC	P ^H (ppm)	Salinity (ppt)	DO (ppm)
1	7.5±2	20.5±2	4.5
15	7.6±2	20.5±2	4.5
30	7.8±2	22.0±2	4.7
45	7.8±2	22.0±2	4.7
60	8.0±2	23.0±2	4.8
75	8.0±2	23.0±2	4.8
90	8.2±2	25.0±2	5.0
107	8.2±2	25.0±2	5.0

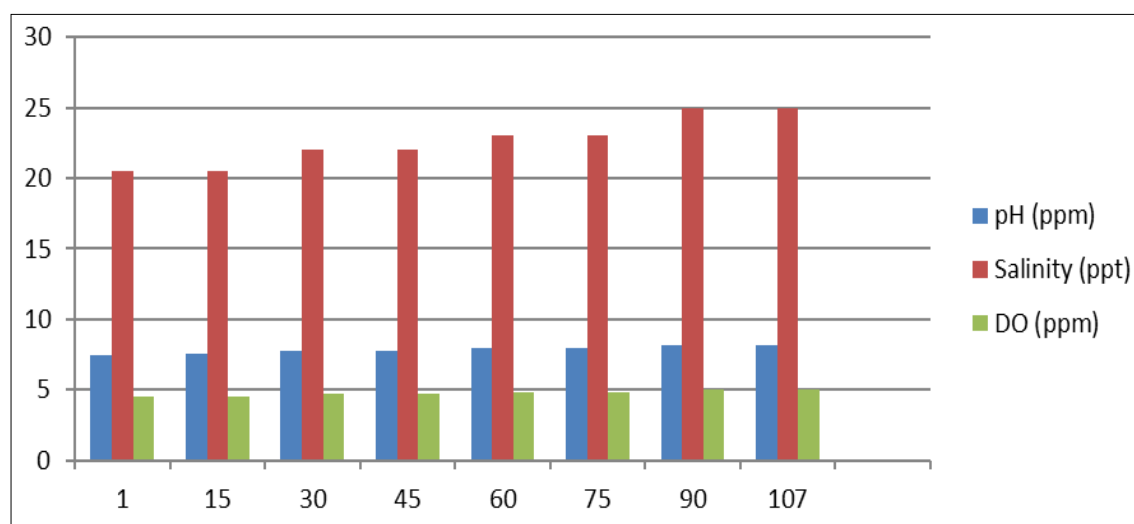
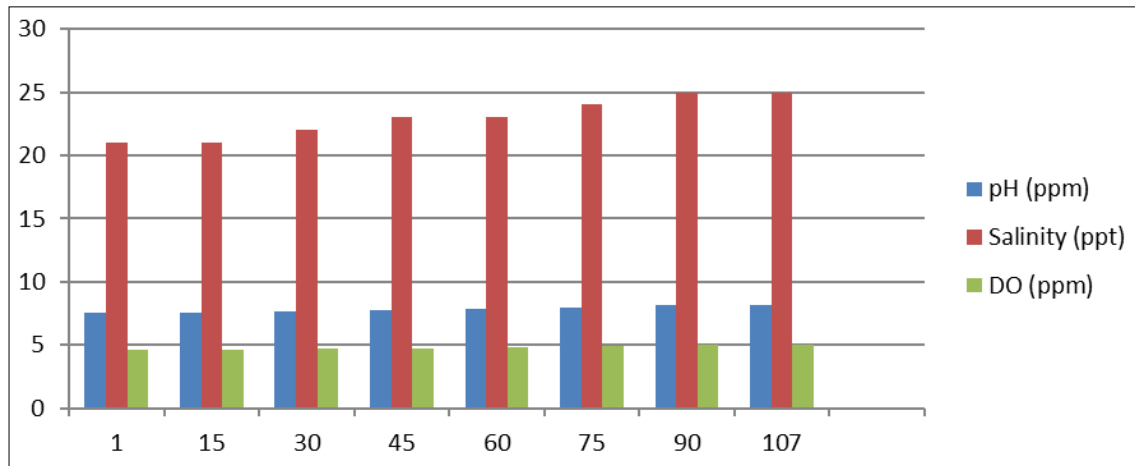


Fig 4: Water quality parameters (Pond B5)

Table 3: Water quality parameters (Pond C5)

DOC	P ^H (ppm)	Salinity (ppt)	DO (ppm)
1	7.6±2	21.0±2	4.6
15	7.6±2	21.0±2	4.6
30	7.7±2	22.0±2	4.7
45	7.8±2	23.0±2	4.7
60	7.9±2	23.0±2	4.8
75	8.0±2	24.0±2	4.9
90	8.2±2	25.0±2	5.0
107	8.2±2	25.0±2	5.0

**Fig 5:** Water quality parameters (Pond C5)**Table 4:** Economic analysis of *L. vannamei* culture in summer season

Details	Pond A5	Pond B5	Pond C5
WSA (ha)	0.4	0.4	0.4
Stocking date	02/03/2026	02/03/2026	02/03/2026
Harvest date	16/06/2026	16/06/2026	16/06/2026
DOC	107	107	107
Stocking density/m ²	50	50	50
SR (%)	80	75	82
Harvest size (Count)	45	44	44
ABW (Grams)	22.30	22.70	22.50
Total feed (Kg)	4550	4600	4800
Total production (Kg)	3568	3405	3690
Production price/kg (Rs)	290	300	290
Expenditure cost/Rs/Kg	210	210	210
Profit/kg (Rs)	80	90	80
FCR	1.27	1.35	1.30
Gross profit (Rs)	1034720	1021500	1070100
Total Expenditure (Rs)	749280	715050	774900
Net Profit (Rs)	285440	306450	295200

Discussion

1. **Water quality parameters:** The current investigation demonstrated that during the shrimp ponds' culture phase, the pH, salinity, and dissolved oxygen (DO) levels stayed largely constant. The pH rose from 7.6 to 8.0, the salinity from 20.0 to 25.0 ppt, and the DO from 4.6 to 5.0 ppm in Pond A5. Ponds B5 and C54 showed similar patterns.
 - a. **pH:** The current study's pH range of 7.5–8.0 suggests comparatively stable water conditions. Because pH variations can impact shrimp physiological functions and combine with the toxicity of nitrogenous substances, maintaining an appropriate pH is crucial. According to Wang *et al.* (2025)^[13], *L. vannamei*'s growth, survival, and physiological state may be

adversely affected by the combined impacts of ammonia, nitrite, salinity, and temperature. Therefore, the farmed shrimp's satisfactory survival and output may have been facilitated by the relatively steady pH found in this study.

- b. **Salinity:** From roughly 20–21 ppt to 25 ppt, salinity increased progressively. This slow rise does not appear to be accompanied by a decline in shrimp survival. According to Ponce-Palafox *et al.* (2025)^[10], *L. vannamei* grew and survived better in normal salinity settings than in low-salinity ones, demonstrating the significance of salinity in shrimp production. Therefore, it seems that the salinity range noted in this study offered ideal circumstances for shrimp production. From a health standpoint, the salinity results are also

significant. In their investigation of *L. vannamei*'s salinity-dependent susceptibility to *Vibrio parahaemolyticus*, Okasha *et al.* (2025) ^[9] showed that salinity can affect shrimp growth performance and antioxidant responses. This implies that it may be crucial to maintain a steady salinity rather than permitting sharp swings for both growth and the physiological state of shrimp.

- c. **Dissolved oxygen:** Throughout the observations, the dissolved oxygen content stayed between 4.5 and 5.0 parts per million. Shrimp respiration, eating, metabolism, and development all depend on adequate DO. The significance of preserving suitable water-quality conditions, particularly DO, during *P. vannamei* cultivation was recently shown by Gonçalves Junior *et al.* (2025) ^[7] and colleagues. In addition to reporting suitable DO conditions, their study demonstrated how proper feeding management might save production costs and increase feed-conversion efficiency. As a result, the DO values found in this study were generally favorable, albeit ongoing observation may be helpful as shrimp biomass increases in later phases of growth.
2. **Survival rate and Production performance:** Pond A5 and Pond B5 produced 3,568 kg and 3,405 kg, respectively, while Pond C5 recorded the maximum output of 3,690 kg and the highest survival rate of 82%. According to Danya Babu Ravuru and Jagadish Naik Mude (2015) ^[3]. Production was 6248, 6633 and 6945 for Pond 1, Pond 2 and Pond 3/ 104, 110 and 112 days in rainy season.
3. **FCR:** Ponds A5, B5, and C5 had FCR values of 1.27, 1.35, and 1.30, respectively; Pond A5 had the lowest FCR. The current study's relatively low FCR suggests effective feed use. According to Mude JN, Ravuru DB (2015) ^[3] FCR was 1.36, 1.40 and 1.46 for 95, 98 and 101days/Pond 1, Pond 2 and Pond 3 in winter season intensive culture. In a semi-intensive synbiotic system, Gonçalves Junior *et al.* (2025) ^[7] discovered that feed restriction decreased FCR by almost 49% and decreased operating expenses, highlighting the close connection between feeding strategy, feed efficiency, and economic performance. More recently, Ferrando-Juan *et al.* (2026) ^[6] found that in biofloc culture, a lower feeding regime preserved shrimp development while reducing economic conversion costs, suggesting that optimal feeding can enhance sustainability and production efficiency.
4. **Economic analysis:** Despite Pond C5 having the highest production, the economic analysis of the current study revealed that Pond B5 had the largest net profit (Rs. 306,450). Pond A5 reported a net profit of Rs. 285,440, while Pond C5 reported a gross profit of Rs. 1,070,100 and a net profit of Rs. 295,200. Pond B5's higher selling price of Rs. 300/kg compared to Rs. 290/kg in Ponds A5 and C5 is partially responsible for its higher net profit. According to Puli, *et al.* (2020) ^[11] Profit was 218.34, 243.63 and 272.66 for Pond 1, Pond 2 and Pond 3/ 120, 123 and 126 day in summer season.

Statistical analysis: The ANOVA test was used in the

statistical analysis. Salinity F-value 0.239, p-value 0.791, p-value 0.526, pH F-value 0.873, and dissolved oxygen F-value 0.288, p-value 0.754. Statistically significant difference between the ponds at $p < 0.05$.

Conclusions

The current study assessed *Litopenaeus vannamei*'s production performance and water quality during the summer culture period. Shrimp survival, feed usage, water quality, and financial returns were all satisfactory in the summer culture system. To sustain and enhance shrimp production, effective feed management and routine water quality monitoring should be maintained. Overall conclusion: Under the study's conditions, *Litopenaeus vannamei* culture was effective during the summer; Pond C5 demonstrated the highest biological performance, Pond A5 the best feed efficiency and Pond B5 the best economic performance.

Acknowledgements

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Abbreviations

L. vannamei: *Litopenaeus vannamei*, WSA: Water spread area, DOC: Days of culture, SR: Survival rate, PL: Post larvae, DO: Dissolved oxygen, ABW: Average body weight, ADG: Average daily growth, CAA: Coastal aquaculture authority, FCR: Food conversion ratio

Conflict of interest

The authors declare no conflict of interest.

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