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A Case Study on *Channa striata* Farming Practices for Sustainable Aquaculture Development in Dharpally Village, Nizamabad District, Telangana, India

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Abstract

Striped murrel (Channa striata) is a high-value freshwater fish with growing interest among farmers seeking alternatives to conventional carp-based aquaculture. This paper evaluates an eight-month grow-out cycle carried out in Dharpally Village, Nizamabad District, Telangana, using farm production and cost records. The earthen pond measured 120 ft × 100 ft with an average water depth of 5 ft, giving a surface area of 12,000 ft² (1,114.84 m²) and an estimated water volume of 1,699 m³. A total of 3,500 fingerlings measuring 2–3 inches were stocked. Mortality during the cycle was reported as 500 fish, corresponding to an estimated survival rate of 85.71%. Commercial Stella and Phai feeds were used, with pellet size increased from 1.2 to 8 mm as the fish grew. Eighty 40-kg bags were consumed, equivalent to 3,200 kg of feed. Against a harvested biomass of 2,500 kg, the calculated feed conversion ratio was 1.28, closely matching the farm-reported value of 1.3. Water was exchanged weekly and pH, dissolved oxygen, ammonia, nitrite, nitrate and temperature were monitored. Recorded values included pH 8.6, dissolved oxygen 6 mg/L, nitrate 0.25 mg/L and ammonia below 0.25 mg/L. Gross revenue from 2,500 kg sold at ₹270/kg was ₹675,000. Using the farm ledger total of ₹546,645, net operating return was ₹128,355 and return on investment was 23.48%. Feed accounted for 79.65% of recorded expenditure. The production cycle shows that pond-based C. striata culture can provide a viable high-value enterprise under local conditions, but profitability depends strongly on feed efficiency, survival, water management and accurate farm records.

Keywords; Channa striata; striped murrel; snakehead; sustainable aquaculture; feed conversion ratio; pond culture; farm economics; Telangana

INTRODUCTION

Freshwater aquaculture in India is dominated by a relatively small group of cultured species, while high-value indigenous fishes remain underused in organized farming. Striped murrel (*Channa striata*) is one such species. It commands strong consumer interest in many parts of South and Southeast Asia and can accept formulated feeds after appropriate weaning. Its market value, air-breathing ability and adaptability to controlled freshwater environments have encouraged efforts to develop hatchery seed production and grow-out methods.

Reliable seed and feeding practices are central to commercial murrel culture. Rawat et al. (2021) reported 85% survival of hatchery-produced, feed-weaned C. striata fingerlings reared in cement tanks and showed that pellet-trained seed can reduce losses associated with cannibalism. Stocking density also affects growth and production, as reported for earthen ponds and tank systems (Rahman et al., 2012; Amin et al., 2015). More recent work in India has shown that C. striata can be reared at high density in artificial tanks using formulated diets, although feed conversion and production cost remain decisive constraints (Vikas et al., 2024).

Feed management and water quality are closely linked. High-protein diets support rapid growth but also increase the organic and nitrogen load entering the culture water.

Changes in dissolved oxygen, ammonia, nitrite and nitrate have been observed during intensive snakehead culture, making routine water-quality management essential (Puspaningsih et al., 2018). Ammonia toxicity also varies with pH, and alkaline water therefore requires careful attention when feed input is high (Qin et al., 1997).

Nizamabad District has an established inland fisheries base. The district Fisheries Department reports 343 tanks under fisheries control and a large network of fisheries cooperative societies, indicating the importance of freshwater fisheries to local livelihoods (Government of Telangana, n.d.).

Within this setting, farm-level evidence is useful for assessing whether murrel culture can support income diversification without excessive feed, water or production losses.

The objective of this paper was to evaluate pond design, stocking, survival, feeding, water-quality management, harvest performance and production economics for one complete *C. striata* grow-out cycle in Dharpally Village. Particular attention was given to feed conversion, cost structure and practical sustainability issues that directly influence farm viability.

MATERIALS AND METHODS

Study site and farm design

The farm was located in Dharpally Village, Nizamabad District, Telangana, India. A single operational pond was followed as a farm case because complete production and expenditure records were available for an eight-month grow-out cycle. The pond measured 120 ft in length and 100 ft in width, with an average water depth of 5 ft. These dimensions correspond to a surface area of 12,000 ft² (1,114.84 m²) and an estimated water volume of 1,699 m³.

Figure 1: Showing the location

- **Kingdom:** Animalia
- **Phylum:** Chordata
- **Class:** Actinopterygii
- **Order:** Anabantiformes
- **Family:** Channidae (snakeheads)
- **Genus:** Channa
- **Species:** striata

Figure 2: *Channa striata*

Table 1: Pond characteristics and stocking details

Variable	Farm value
Pond length	120 ft
Pond width	100 ft
Average water depth	5 ft
Surface area	12,000 ft² (1,114.84 m²)
Estimated water volume	1,699 m³
Initial stocking	3,500 fingerlings
Fingerling size	2–3 inches
Reported fingerling price	₹20/fish
Calculated surface stocking density	3.14 fish/m²
Calculated volumetric stocking density	2.06 fish/m³

Stocking, feeding and routine management

A total of 3,500 fingerlings measuring approximately 2–3 inches were stocked. Commercial Stella and Phai feeds were supplied during the grow-out period. Pellet size was increased from 1.2 mm for smaller fish to 8 mm for larger fish. Feed use was recorded by bag count. Eighty bags, each containing 40 kg, were used during the cycle, giving a total feed input of 3,200 kg.

Water was exchanged weekly. Farm monitoring included pH, dissolved oxygen, ammonia, nitrite, nitrate and temperature. The records available for analysis contained numerical values for pH, dissolved oxygen, nitrate and ammonia; nitrite and temperature were monitored but their numerical observations were not retained in the dataset used for this manuscript.

Harvest and biological indicators

Harvest took place after eight months. The farm reported market-size fish in the range of 900–1,000 g and a total harvested biomass of 2,500 kg. Mortality over the production cycle was recorded as 500 fish. Survival rate, mortality rate, feed conversion ratio (FCR), stocking density and production per unit area were calculated from the farm records.

$$\text{Survival (\%)} = (\text{number of fish surviving} \div \text{number stocked}) \times 100$$

$$\text{Mortality (\%)} = (\text{number of mortalities} \div \text{number stocked}) \times 100$$

$$\text{FCR} = \text{total feed supplied (kg)} \div \text{harvested biomass (kg)}$$

$$\text{ROI (\%)} = \text{net operating return} \div \text{total recorded investment} \times 100$$

Economic analysis

Production costs were taken from the farm ledger. The recorded components were fingerlings, feed, transportation, labour and medicines. Gross revenue was calculated from harvested biomass multiplied by the farm-gate price. Net operating return was gross revenue minus recorded investment. Cost per kilogram, revenue-to-cost ratio and return on investment were calculated from the same records.

RESULTS

Survival, production and feed conversion

Of the 3,500 fish initially stocked, 500 were reported lost during the eight-month cycle. The corresponding survival rate was 85.71% and mortality was 14.29%. Harvested biomass reached 2,500 kg, equivalent to 2.24 kg/m² of pond surface area or 1.47 kg/m³ of estimated water volume for the cycle.

Total feed use was 3,200 kg. Dividing feed input by harvested biomass gave an FCR of 1.28. This calculated value agrees closely with the farm-reported FCR of 1.3. Average feed expenditure was approximately ₹136.06/kg of feed.

Figure 3: Harvested fish

Table 2 Biological and production performance

Indicator	Value
Culture period	8 months
Initial stock	3,500 fish
Reported mortality	500 fish
Estimated survivors	3,000 fish
Survival rate	85.71%
Mortality rate	14.29%
Reported harvest size	900–1,000 g/fish
Harvested biomass	2,500 kg

Total feed input	3,200 kg
Calculated FCR	1.28
Farm-reported FCR	1.3
Production per pond area	2.24 kg/m²/cycle
Production per estimated water volume	1.47 kg/m³/cycle

Note. The biomass-derived mean weight for 3,000 surviving fish is approximately 833 g/fish. The reported 900–1,000 g value is therefore best interpreted as the market-size range observed at harvest rather than a verified whole-population mean.

Water-quality observations

The pond water was moderately alkaline, with a recorded pH of 8.6. Dissolved oxygen was 6 mg/L, nitrate was 0.25 mg/L and ammonia remained below 0.25 mg/L at the recorded sampling point. These values were considered alongside weekly water exchange and routine monitoring of nitrite and temperature.

Table 3: Water-quality variables recorded on the farm

Parameter	Recorded value / status
pH	8.6
Dissolved oxygen	6 mg/L
Nitrate	0.25 mg/L
Ammonia	<0.25 mg/L
Nitrite	Monitored; numerical value unavailable
Temperature	Monitored; numerical value unavailable
Water exchange	Weekly

Cost structure and farm return

Feed was the largest production expense at ₹435,395, representing 79.65% of the recorded investment. The ledger listed ₹60,000 for fingerlings, ₹23,250 for transportation, ₹20,000 for labour and ₹8,000 for medicines. Total recorded investment was ₹546,645.

The 2,500 kg harvest was sold at ₹270/kg, producing gross revenue of ₹675,000. Net operating return was therefore ₹128,355, or about ₹1.28 lakh. Production cost was ₹218.66/kg and the operating surplus over recorded cost was ₹51.34/kg. The revenue-to-cost ratio was 1.23 and the calculated return on investment was 23.48%.

Table 4: Economic performance of the eight-month production cycle

Cost or return item	Amount / value
Fingerlings (ledger value)	₹60,000
Feed	₹435,395
Transportation	₹23,250
Labour	₹20,000
Medicines	₹8,000
Total recorded investment	₹546,645
Harvested biomass	2,500 kg
Farm-gate price	₹270/kg
Gross revenue	₹675,000
Net operating return	₹128,355
Feed share of total cost	79.65%
Production cost	₹218.66/kg
Operating surplus	₹51.34/kg
Revenue-to-cost ratio	1.23
Return on investment	23.48%

Note. The ledger records ₹60,000 for fingerlings, equivalent to 3,000 fish at ₹20 each, whereas the production record lists 3,500 fish stocked. Because the ledger total exactly matches ₹546,645, the economic analysis uses ₹60,000 as recorded. The original purchase record should be checked before journal submission.

DISCUSSION

Survival and grow-out performance

An 85.71% survival rate is a workable outcome for pond-based murrel culture and is close to the 85% survival reported by Rawat et al. (2021) for pellet-weaned fingerlings in cement tanks. The similarity is useful because seed quality and early acceptance of formulated feed are major practical concerns in Channa culture. Direct comparison should nevertheless be cautious: the published trial used a different system, stocking density and production period.

The farm harvested 2,500 kg from 1,114.84 m², giving 2.24 kg/m² per cycle. Vikas et al. (2024) obtained much higher areal production under very high-density tank culture but with an FCR of 1.8 and a reported production cost of ₹312/kg. The Dharpally system operated at a lower density and achieved a lower calculated FCR, illustrating a different production strategy rather than a direct performance advantage. For farmers with existing ponds, moderate-density culture may offer a practical balance between capital requirement, feed use and marketable output.

Feed efficiency and cost sensitivity

Feed efficiency was the strongest technical feature of the production cycle. An FCR of 1.28 means that 1.28 kg of feed was used for each kilogram of harvested biomass. Feed conversion in snakehead varies with fish size, ration, diet quality, temperature and stocking density (Qin & Fast, 1996; Qin & Fast, 1998). Because feed represented nearly 80% of total recorded expenditure in Dharpally, even a small deterioration in FCR would quickly reduce the operating margin.

The use of pellets from 1.2 to 8 mm also reflects an important management principle: pellet size should follow mouth size and growth stage. Regular sampling of fish weight would strengthen this practice further by allowing the daily ration to be linked to standing biomass rather than visual estimation alone. A feed log that records quantity offered, mortalities and periodic sample weight would also make FCR estimates more defensible across successive crops.

Water quality and weekly exchange

The recorded dissolved oxygen concentration of 6 mg/L was adequate at the time of measurement. The pH of 8.6, however, deserves attention because the toxic unionized fraction of ammonia increases as pH rises. Qin et al. (1997) showed that ammonia tolerance in snakehead is strongly influenced by pH. Keeping ammonia below 0.25 mg/L, as recorded on the farm, is therefore preferable to relying only on the species' air-breathing capacity.

Weekly water exchange provided a simple means of controlling waste accumulation, but fixed-interval exchange can use more water than necessary. Puspaningsih et al. (2018) showed that nitrogen compounds and dissolved oxygen change as feed-derived waste accumulates in snakehead culture. A more resource-efficient approach would combine regular pH and oxygen checks with ammonia and nitrite measurements, then adjust exchange volume according to water condition. Aeration and removal of settled organic matter could further reduce the need for large routine exchanges.

Economic viability

The farm generated ₹675,000 in gross revenue and ₹128,355 in net operating return based on the ledger supplied for the crop. A 23.48% return on recorded investment over eight months is commercially encouraging, although it should not be treated as a guaranteed annual return. The calculation does not include depreciation of pond construction, interest on capital, land rental or an imputed value for family labour unless those items were already embedded in the farm records.

Profitability is particularly sensitive to two variables: feed cost and sale price. The reported average feed cost was about ₹136/kg, while the farm-gate fish price was ₹270/kg. Maintaining efficient feed conversion therefore protects a large share of the margin. Direct sale to retailers, live-fish traders or organized local markets may also improve returns where the price premium exceeds added transport and handling costs.

Sustainability implications for Dharpally

Three aspects of the production cycle are relevant to sustainable aquaculture. First, feed conversion was efficient relative to many intensive snakehead trials, lowering both feed expenditure and the amount of waste entering the pond per kilogram of fish produced. Second, the farm maintained routine water exchange and monitored major water-quality variables, creating a basis for more precise water-use management. Third, a high-value species generated a positive operating return from a relatively small pond area, which may support livelihood diversification where seed, feed and markets are accessible.

These benefits are not automatic. Sustainability would be weakened by poor survival, excessive water exchange, unrecorded chemical use, or dependence on costly feed without corresponding growth. The most practical improvements are therefore better biomass sampling, complete water-quality records, mortality logs, feed budgeting, careful health management and water exchange triggered by measured need. Such measures align farm profitability with lower resource waste rather than treating production volume alone as the measure of success.

CONCLUSION

The Dharpally farm completed an eight-month *C. striata* grow-out cycle with 2,500 kg of harvested biomass from a 12,000 ft² pond. Estimated survival was 85.71%, total feed use was 3,200 kg and the calculated FCR was 1.28. Weekly water exchange, together with monitoring of pH, dissolved oxygen and nitrogenous wastes, supported routine pond management. At a farm-gate price of ₹270/kg, the cycle generated ₹675,000 in gross revenue and ₹128,355 in net operating return on the recorded investment.

The farm records show that striped murrel can function as a profitable diversification species under local pond conditions, but the economic margin depends heavily on feed efficiency and survival. The next improvement should be stronger record keeping: exact stocking and harvest counts, monthly sample weights, daily feed use, time-stamped water-quality values and a complete cost ledger. With those records in place, additional production cycles could be compared statistically and the farming model could be evaluated across a wider group of farmers in Nizamabad District.

LIMITATIONS

The analysis covers one farm and one production cycle, so the results cannot be generalized to all *C. striata* farms in

Telangana. Several water-quality variables were monitored but were not retained as complete time-series data. Two record inconsistencies also need verification: the production sheet lists 3,500 fish stocked, while the cost ledger lists ₹60,000 for 3,000 fingerlings at ₹20 each; and the biomass-derived mean harvest weight (approximately 833 g if 3,000 fish survived) is lower than the reported market-size range of 900–1,000 g. These differences do not change the reported total biomass or ledger-based profit calculation, but the original farm records should be reconciled before submission to a journal.

Declaration of generative AI and AI-assisted technologies

AI-assisted language and formatting support was used to improve organisation and presentation. The authors must verify all project observations, calculations and references and remain fully responsible for the final manuscript. This declaration should be modified to comply with the selected journal's policy.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

REFERENCES

[1] Amin, S. M. N., Muntaziana, M. P. A., Kamarudin, M. S., Rahim, A. A., & Rahman, M. A. (2015). Effect of different stocking densities on growth and production performances of chevron snakehead *Channa striata* in fiberglass tanks. North American Journal of Aquaculture, 77, 289–294.

[2] Government of Telangana. (n.d.). Fisheries Department, Nizamabad District. Nizamabad District Administration. Accessed 17 August 2026.

[3] Puspaningsih, D., Supriyono, E., Nirmala, K., Rusmana, I., Kusmana, C., & Widiyati, A. (2018). The dynamics of water quality during culture of snakehead fish (*Channa striata*) in the aquarium. Omni-Akuatika, 14(2). https://doi.org/10.20884/1.oa.2018.14.2.568

[4] Qin, J. G., & Fast, A. W. (1996). Effects of feed application rates on growth, survival and feed conversion of juvenile snakehead Channa striatus. Journal of the World Aquaculture Society, 27(1), 52–56. https://doi.org/10.1111/j.1749-7345.1996.tb00593.x

[5] Qin, J. G., Fast, A. W., & Kai, A. T. (1997). Tolerance of snakehead Channa striatus to ammonia at different pH. Journal of the World Aquaculture Society, 28(1), 87–90.

[6] Qin, J. G., & Fast, A. W. (1998). Effects of temperature, size and density on culture performance of snakehead, Channa striatus (Bloch), fed formulated feed. Aquaculture Research, 29, 299–303.

[7] Rahman, M. A., Arshad, A., & Amin, S. M. N. (2012). Growth and production performance of threatened snakehead fish, Channa striatus (Bloch), at different stocking densities in earthen ponds. Aquaculture Research, 43(2), 297–302. https://doi.org/10.1111/j.1365-2109.2011.02830.x

[8] Rawat, A., Raizada, S., & Srivastava, P. P. (2021). Growth and survival of hatchery produced and feed weaned striped murrel *Channa striata* (Bloch, 1793) fingerlings in cement tanks. Indian Journal of Fisheries, 68(2), 52–59. https://doi.org/10.21077/ijf.2021.68.2.108907-07

[9] Vikas, P. A., Ebeneezar, S., & Subramannian, S. (2024). High-density farming of striped snakehead *Channa striata* (Bloch, 1793) in artificial tanks. Journal of Krishi Vigyan, 12(3), 544–549.