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CASE STUDY: BUSINESS ANALYSIS IN A COMMERCIAL NURSERY FOR PEARL GENTIAN GROUPER FISH (EPINEPHELUS FUSCOGUTTATUS × EPINEPHELUS LANCEOLATUS) IN SITUBONDO EAST JAVA

Studi Kasus: Performa Usaha Pendederan Ikan Kerapu Cantang (*Epinephelus fuscoguttatus* X *Epinephelus lanceolatus*) di Situbondo, Jawa Timur

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ABSTRACT

The nursery phase of hybrid grouper (kerapu cantang; Epinephelus fuscoguttatus × Epinephelus lanceolatus) farming is a crucial business segment, as it serves as a key link in the seed supply chain for grow-out operations. This study aims to analyze the profitability aspects of nursery operations at a commercial farm in Indonesia, using a trading enterprise (UD) in Situbondo, East Java, as a model. The research was conducted by collecting both primary and secondary data through interviews. Observations revealed an average fish survival rate of 86.5%, resulting in an estimated annual production of 99,000 fingerlings using a total of 14 nursery tanks measuring 4×3×1 m³ each. The largest investment cost components were the nursery tanks (40%) and water installation systems (33%). The main fixed and variable cost components were employee salaries (69%) and feed (84%), respectively. Financially, the nursery operation is profitable, generating an annual profit of IDR 274,338,923 and an R/C ratio of 1.59. The investment payback period is estimated at 1.68 years (20 months). Optimization of operations is recommended through production scale-up in the second year, by reducing feed costs, or by increasing the fry production.

Keywords: Aquaculture, Financial, Fry, Investment, Profit.

ABSTRAK

Kegiatan pendederan ikan kerapu cantang (*Epinephelus fuscoguttatus* x *Epinephelus lanceolatus*) merupakan segmentasi usaha yang penting karena merupakan rantai penyedia benih ikan sebagai input kegiatan pembesaran. Penelitian ini bertujuan untuk menganalisis aspek profitabilitas kegiatan pendederan pada farm komersial di Indonesia, dengan sebuah Usaha Dagang (UD) di Situbondo, Jawa Timur, sebagai model. Penelitian dilakukan dengan mengumpulkan data primer dan data sekunder (wawancara). Hasil pengamatan menunjukkan bahwa rerata tingkat kelangsungan hidup ikan sebesar 86,5% menghasilkan estimasi produksi sebanyak 99.000 ekor benih/ tahun menggunakan total 14 bak pemeliharaan ukuran 4x3x1 m3.

Komponen biaya investasi terbesar meliputi bak pemeliharaan (40%), dan instalasi air (33%). Komponen biaya tetap dan biaya variable terbesar yaitu masing-masing, gaji karyawan (69%) dan pakan (84%). Secara finansial kegiatan pendederan ini menguntungkan (profitable) dengan keuntungan sebesar Rp. 274.338.923/tahun dan R/C ratio 1,59. Durasi pengembalian biaya investasi diperkirakan membutuhkan waktu selama 1,68 tahun (20 bulan). Rekomendasi optimalisasi kegiatan dapat dilakukan menambah skala produksi pada tahun kedua, menekan biaya pakan, dan meningkatkan produksi benih ikan.

Kata Kunci: Akuakultur, Benih, Finansial, Investasi, Keuntungan.

INTRODUCTION

Grouper is an aquaculture commodity with high economic value, with a stable increase in export demand reaching 30.75% per year (KKP, 2018). The export value of Indonesian grouper is stable at 16.45 million USD per year, with primary markets such as Hong Kong, China, Japan, and Singapore. One of the superior types of grouper is the cantang grouper, a cross between the tiger grouper and the kertang grouper (Epinephelus fuscoguttatus × Epinephelus lanceolatus), which is known to have a faster growth rate than its parent (Fan et al., 2020; Putra et al., 2020; Zhang et al., 2023).

The nursery segment is an important stage in determining the success of culture, because it functions as an initial selection of superior seeds for consumption fish (Zhang et al., 2015). This segment tends to have more measurable risks and cost requirements than seeding and rearing. However, without good technical and financial management, the nursery still has the potential to lose money.

The sustainability of an aquaculture business is assessed from the performance of fish growth and its financial feasibility. Many farmers still ignore the importance of business analysis, and only assess the profit from cash flow. Economically, profitability requires a comprehensive evaluation of business costs and income (Astari et al., 2024). Therefore, a business analysis study is needed to assess the cultivation unit's financial health objectively. This study aims to analyze the performance of the cantang grouper nursery business on Indonesian commercial farms. The results of this study are expected to provide an overview of the financial status of the business and strategic recommendations to improve the sustainability of the cultivation business unit.

METHODS

Observation activities were carried out in June-July 2024 by taking a model from one of the Trading Enterprises (UD, Usaha Dagang), which was classified as a Micro, Small, and Medium Enterprise (MSME/UMKM, Usaha Mikro, Kecil, Menengah) in Kraja Village, Gelung Village, Panarukan District, Situbondo, East Java (7°68'76" S).

Fish Nursery

The nursery activities for cantang grouper were carried out in 14 concrete tanks measuring 4×3×1 m^3 (Figure 1a). The tanks were designed without sharp corners on the inside to prevent the accumulation of organic material and to facilitate cleaning. Each tank had an inlet channel for seawater and freshwater at the top and an outlet channel at the bottom. Seawater was sourced from nearby coastal waters using a 1 HP pump with 1500 watts of power and a 4-inch diameter pipe extending 320 m from the shoreline. The incoming seawater passed through a series of filtration processes involving silica sand, charcoal, bioballs, and injuk (Arenga palm fiber) filters before entering the seawater reservoir.

Freshwater was obtained from a 6 m deep drilled well, pumped using a 1 HP pump with 500 watts of power, and collected in a freshwater reservoir. Water in both reservoirs was

disinfected using Sanocare PUR® to inhibit the growth of pathogenic microbes. Water from both sources flowed continuously into the fish maintenance tanks to push out water and organic waste, operating under a flow-through system. The resulting wastewater was treated in a wastewater treatment plant (IPAL, Instalasi Pengolahan Air Limbah) before being discharged from the facility. Each fish tank had 10 aeration points connected to a blower with a 1/2 HP capacity and 500 watts of power.

The fish seeds were sourced from the BPBAP Situbondo Seeding Unit and the Barokah Melinium hatchery. The initial seed size ranged from 2.5–3.0 cm, and they were grown to a size of up to 10 cm. If seeds of this size were unavailable, larger seeds (6–7 cm) were used. The stocking density ranged from 0.5 to 1 fish/L. Prior to stocking, the seeds were acclimatized for 5 minutes to adjust to the tank's water temperature and soaked in an acriflavine solution at 3–5 ppm for 1 hour to prevent disease outbreaks.

The fish were fed commercial pellets with a protein content of 40–55%: KAIO EP1®, KAIO EP2®, and KAIO EP3®, corresponding to seed sizes of 3–4 cm, 5–7 cm, and 8–10 cm, respectively, provided to satiation (Figure 1b). Feeding was conducted every 1–12 hours, more frequently for smaller seed sizes. Water quality was monitored daily, while siphoning was done twice daily. Grading and sorting based on size and quality were performed periodically. The total nursery cycle, including tank preparation, lasted approximately 2 months (60 days).

Harvesting was carried out partially. The fish seeds were packaged in sealed plastic bags filled with maintenance water and oxygen. Ice cubes were added to the water (final temperature 24–26 °C) to lower the metabolic rate of the fish seeds during transportation. The distribution areas for fish seeds outside the city included Batam, Padang, Medan, the Riau Islands, Jepara, and Jakarta.

(a)

(b)

Figure 1. (a) Grouper rearing concrete tanks, (b) Commercial pellets feeding

Observed Parameters

The parameters observed include primary data related to zootechnical performance, such as fish survival rate, and secondary data in the form of (a) organizational management aspects (vision, mission, and organizational structure) and (b) business profitability aspects (cost components, selling price, and production volume). Primary data were obtained through observation and interviews with business owners, while secondary data were obtained from supporting documents owned by UD.

Profitability aspect parameters of the business, including investment costs, fixed costs, variable costs, total costs, revenue, profit, break-even point (BEP), cost of production, payback period (PP), and revenue and cost ratio (R/C ratio).

- The formula obtains total costs: Total costs (IDR) = Fixed Costs (IDR) + Variable Costs (IDR).
- Total revenue is obtained by the formula: Revenue (IDR) = Number of seed production per year (fish) × Selling price of seeds (IDR).
- Profit is obtained by the formula: Profit (IDR) = Revenue (IDR) – Total costs (IDR).
- The break-even formula obtains the break-even point (BEP) price: BEP price (IDR) $= \frac{\text{Fixed cost (IDR)}}{1-(\frac{\text{Variable cost (IDR)}}{\text{Total revenue (IDR)}})}$.
- *Break even point (BEP)* unit is obtained using the formula*: BEP* unit *(*fish*)* $= \frac{\text{Fixed cost (IDR)}}{\text{Price per unit (IDR)}-(\frac{\text{Variable cost (IDR)}}{\text{Production (Fish)}})}$.
- The cost of goods sold (COGS) is obtained using the formula: COGS (IDR) $= \frac{\text{Total cost (IDR)}}{\text{Production (ekor)}}$.
- *Payback period* (PP) is obtained using the formula*: PP* (year) $= \frac{\text{Investment cost (IDR)}}{\text{Profit (IDR)}}$.
- *Revenue and cost ratio* (R/C ratio) obtained by the formula: R/C ratio $= \frac{\text{Total revenue (IDR)}}{\text{Total cost (IDR)}}$.

Data Analysis

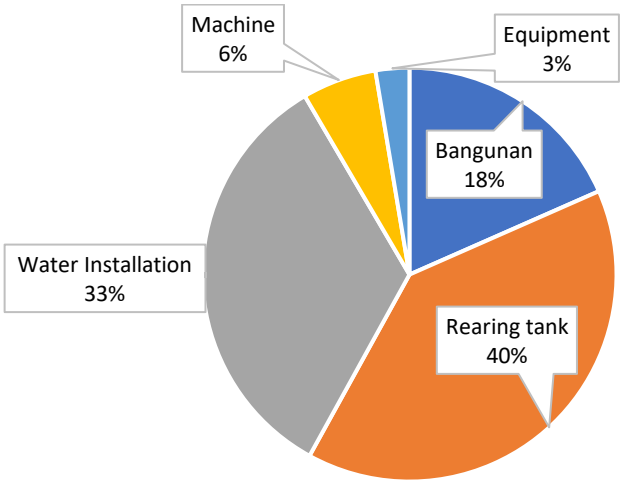
Data analysis using Microsoft Excel 2013 and SPSS version 23. This study was conducted using a case study survey method, with the selection of research locations carried out intentionally (purposively) by considering the criteria of business entities that have been running hybrid grouper seed production activities for more than 5 years. This study uses primary data and secondary data. Primary data were collected through surveys using questionnaires, interviews, and direct observation of activities. Profitability data were analyzed descriptively using graphs and tables. R/C ratio data were analyzed quantitatively to determine the profitability of the nursery business. If R/C> 1 means the business is feasible to run; R/C = 1 means the business is at the break-even point, and R/C <1 means the business is not feasible to run (Palupi *et al*., 2021).

RESULT

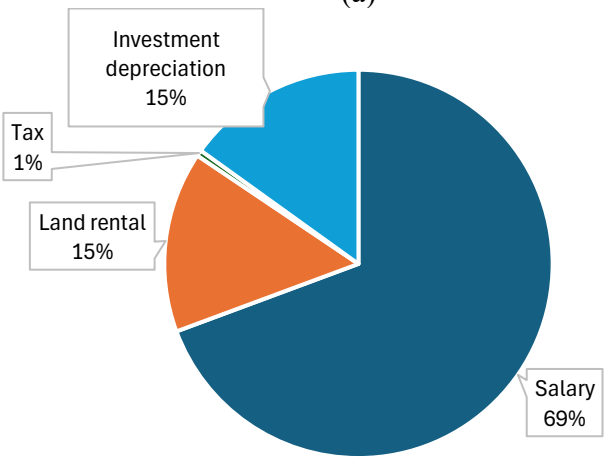
The observation results on the ongoing cycle are extrapolated into annual calculations using stable price and cost assumptions. The proportion of investment, fixed, and variable costs is shown in Figure 2. Investment costs (Figure 2a) consist of several components grouped into the cost of purchasing and installing maintenance tanks (40%), water installation (reservoir) (33%), buildings (18%), machines (6%), and supporting equipment (3%). Meanwhile, the proportion of annual fixed costs (Figure 2b) consists of salaries (managers and employees; 69%), land rent (15%), investment depreciation (15%), and annual taxes (1%). Variable costs

(Figure 2c) are dominated by feed (84%), followed by packaging equipment (12%), chemicals (4%), and the rest are cleaning equipment (<1%).

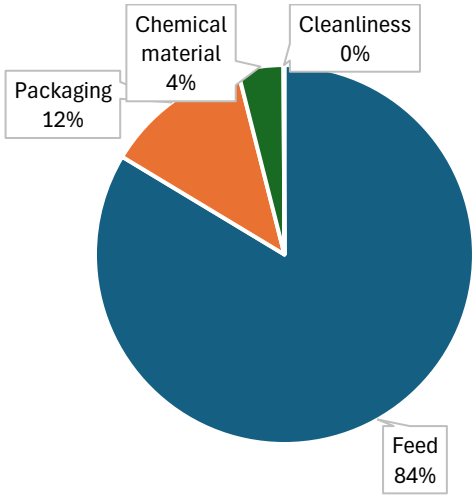
The results of the profitability analysis of the cantang grouper nursery activities are shown in Table 1. Based on the field observations, the survival rate of cantang grouper seeds reached 86.5%. The nursery was conducted for 2 months, with six cycles a year. This value was used as an assumption of survival for one year to calculate total seed production. The financial analysis showed that the business made a positive profit of IDR 210,330,000.00 for 1 year, with an estimated investment return duration of 1.68 years. The R/C ratio value reached 1.59, with a BEP value of 48,130 individual seeds.



(a)



(b)



(c)

Figure 2. Components of (a) investment costs, (b) fixed costs per year, and (c) variable costs per year for cantang grouper fish nursery activities.

Table 1. Analysis of cantang grouper fish nursery business

Parameter	Value
Survival rate (%)	86.5
Selling price per fish (IDR)	5,700
Rearing period per cycle (month)	2
Number of cycles per year (cycles production)	6
Investment cost (IDR)	353,312,000
Fixed cost (IDR)	199,000,000
Variable cost (IDR)	154,968,000
Total cost (IDR)	353,968,000
Production (Fish)	99,000
Total revenue (IDR)	564,300,000
Profit (IDR)	210,332,000
BEP price (IDR)	274,338,923
BEP unit (Fish)	48,130
Cost of goods sold	3,575
Payback period	1.68
Revenue/Cost ratio	1.59

BEP = *break-even point*

DISCUSSION

The results of the business profitability analysis (Table 1) show that the cantang grouper fish nursery activity is profitable, with business profits reaching IDR 210,332,000/year, or around IDR 17,527,667/month. This value is about 8 times higher than the Regional Minimum Wage (UMR) of Situbondo Regency, East Java Province, which is IDR 2,335,209/month (Bappeda-Jatim, 2025). The R/C ratio is the comparison between total revenue and total costs incurred (Wijayanto *et al*., 2020). An R/C value of 1.0 indicates that the business is at the break-

even point—not generating profit or loss (Adha-Taridala *et al*., 2019). In this study, the R/C ratio value reached 1.59, which means that the income received was 59% higher than the total costs incurred each year. This is in line with research conducted by (Astari *et al*., 2024).

The BEP calculation shows that the business will reach break-even if the seeds sold reach 48,130/year, or worth IDR 199,000,000/year, assuming the selling price remains at IDR 5,700/fish. The sales volume has reached 99,000/year, or twice the BEP value, indicating that this business is far above the break-even point. The duration of the payback period (PP) was recorded at 1.68 years, or around 20 months (equivalent to 10 production cycles). This time is relatively short in the aquaculture business, especially compared to the technical period of the investment components, which ranges from 1.5 to 15 years (Ahmad-Ansari *et al*., 2020; Mohammad *et al*., 2018). Therefore, this investment is feasible and promising for investors.

Profitability can be increased by increasing production scale and reducing feed costs, which account for 84% of total variable costs (Figure 2c). Additional investment to expand the production scale can be made starting in the second year, when the PP value has been achieved. However, it is also necessary to consider the need for funds to replace initial investment components whose technical life has expired, especially small supporting equipment with a technical life of 2 years, such as a sieve or cleaning equipment. Increased feed efficiency will reduce the proportion of overall feed costs. Feed costs are the most significant component in grouper cultivation, reaching 84% of this study's total variable costs per year (Figure 2c). This is linear with previous studies; the combined cost of feed, seed, and labor reached 90% of the total cost (Dennis *et al*., 2020).

The feed used for cantang grouper has a high price due to its high protein content (40-55%), especially when compared to freshwater fish feed such as tilapia (24-28%). Suppression of feed costs can be done by increasing feed efficiency, for example, by determining the right nutrient level of pellet feed and using more economical alternative raw materials. In addition to ensuring high protein levels, pellet feed should not contain high amounts of carbohydrates. This is because grouper fish have limitations in digesting carbohydrates; high carbohydrate levels (16%) cause intestinal edema (Deng *et al*., 2018; Goodwin *et al*., 2002; Li *et al*., 2020; Thwaite *et al*., 2022). Replacing fish meal with cheaper alternative protein ingredients from livestock and agricultural by-products can reduce feed costs, without reducing fish growth performance (Millamena, 2002). Feed cost suppression can also be done by providing additional feed in the form of plankton as in its natural habitat (Burford *et al*., 2020; Kuo *et al*., 2021; Tew *et al*., 2016). This can also reduce businesses' dependence on stocks and fluctuations in the price of commercial pellet feed. However, the main challenges of using natural feed are its limited availability on the market, impractical cultivation practices, the high risk of species contamination in pure culture, and the preference of fish seeds for natural feed (Zhang *et al*., 2015).

In addition to increasing the scale and efficiency of feed, business profits can also be increased through production optimization by increasing the survival rate of fish. This can be done by ensuring that water quality is well maintained and preventing disease-related fish deaths. Maintaining water quality, such as stable maintenance water temperature at the optimal range (28°C), has increased fish metabolism and growth (Das *et al*., 2021; Ehrlén & Morris, 2015; Rimmer & Glamuzina, 2019). Meanwhile, increasing the fish's immune system in fighting disease-causing microorganisms can be done, for example, by applying vaccines (Thwaite *et al*., 2022; Wi *et al*., 2015).

CONCLUISON

The cantang grouper fish nursery activity with a business model applied in Situbondo Regency, East Java, showed profitable results with a relatively short investment return duration

(20 months). This supported business sustainability and showed a feasible and promising investment potential.

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