

Income Analysis of *Eucheuma cottonii* Seaweed Farming: A Case Study in Mamuju Regency, Indonesia

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Article Info

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Abstract

This study aims to analyze the income generated from Eucheuma cottonii seaweed farming by identifying the total production costs, gross income, and net income obtained by seaweed farmers. The research was conducted in Mamuju Regency, where the population comprised 156 seaweed farmers. A purposive sampling technique was employed, selecting 15% of the population, resulting in a sample of 23 respondents. The study took place from July to August 2022 and utilized both quantitative and qualitative approaches. Data were collected from primary sources through direct interviews and questionnaires, as well as from secondary sources such as official reports and related literature. The findings indicate that Eucheuma cottonii farmers actively attempt to minimize production costs to maximize profitability. The analysis shows that the average production cost incurred per farming cycle was IDR 5,904,706. In contrast, the average gross income reached IDR 10,496,739, leading to an average net income of IDR 4,595,294. These results suggest that Eucheuma cottonii seaweed farming contributes significantly to the economic well-being of coastal communities. The relatively high net income reflects the potential of seaweed cultivation as a sustainable livelihood option in marine-based economies. Overall, the study highlights the economic viability of Eucheuma cottonii cultivation and supports its development as an income-generating activity for small-scale farmers in coastal regions.

Introduction

Indonesia is a maritime country with approximately two-thirds of its territory consisting of ocean, presenting vast potential in the development of marine-based economic activities. Among the many commodities derived from marine resources, seaweed (*Eucheuma cottonii*) has emerged as a high-value aquaculture product due to its diverse applications in food, cosmetics, and pharmaceuticals. The tropical climate and extensive coastal areas of Indonesia offer ideal conditions for seaweed cultivation, making the country one of the world's leading producers of seaweed (FAO, 2020).

Despite its potential, the development of the seaweed sector in Indonesia is constrained by several challenges. Only around 3% of the potential 1.2 million hectares of seaweed farming areas are currently being utilized, limiting production output (Ministry of Marine Affairs and Fisheries, 2010). In many coastal regions, seaweed farmers continue to rely on traditional knowledge and face limited access to technical support, post-harvest facilities, and fair market systems. These constraints affect

the profitability and sustainability of seaweed farming, especially for small-scale producers.

In Central Mamuju Regency, particularly in Kambunong Village, *Eucheuma cottonii* farming has become a significant source of livelihood for coastal communities. However, empirical data on income levels, cost structures, and profitability remain scarce. Understanding the financial performance of seaweed farming is crucial for assessing its role in improving rural welfare and informing policies that promote sustainable aquaculture development.

Therefore, this study aims to analyze the income of *Eucheuma cottonii* seaweed farmers by assessing production costs, revenues, and net income. The findings are expected to provide insights into the economic viability of seaweed farming in the region and contribute to strategies for enhancing community-based aquaculture enterprises.

Literature Review

1. Seaweed Farming and Economic Potential

Seaweed is classified as a marine aquaculture commodity with significant global

demand due to its role as a raw material in the production of carrageenan, agar, and alginate. These hydrocolloids are essential ingredients in the food processing, cosmetics, and pharmaceutical industries (Msuya et al., 2017). In particular, *Eucheuma cottonii* is widely cultivated in Southeast Asia due to its high carrageenan content and adaptability to tropical marine environments.

Seaweed farming has demonstrated socio-economic benefits, including increased household income, employment generation, and reduced environmental degradation caused by destructive fishing practices (Neish, 2013). It is also considered an inclusive economic activity that engages women and marginalized coastal communities.

2. Types of Seaweed Cultivated in Indonesia

According to Kordi (2011), seaweed in Indonesia consists of four main classes: red algae (*Rhodophyceae*), green algae (*Chlorophyceae*), brown algae (*Phaeophyceae*), and blue-green algae (*Cyanophyceae*). Among these, *Rhodophyceae* is the most economically valuable, particularly *Eucheuma cottonii* and *Kappaphycus alvarezii*, which are widely cultivated for their carrageenan content.

3. Seaweed Production Inputs and Cultivation Practices

Seaweed cultivation in Indonesia typically employs the long-line method, where seedlings are tied to ropes suspended in the sea with the help of buoys and anchors (Jaya, 2013). Key input factors affecting production include seed quality, labor, cultivation area, and maintenance practices. Efficient post-harvest handling, such as proper drying and storage, also plays a critical role in maintaining product quality and determining market price.

4. Cost and Income Analysis in Aquaculture

Economic analysis in aquaculture involves the estimation of production costs, revenues, and net income. According to Soekartawi (1995), income can be calculated using the formula:

$$\Pi = TR - TC,$$

where Π = net income, TR = total revenue, and TC = total cost.

Production costs are typically divided into fixed and variable costs. Fixed costs include equipment and infrastructure, while variable costs involve inputs such as seeds, labor, and maintenance (Mulyadi, 2003). Revenue is the product of output quantity and market price, and profitability is directly influenced by both efficiency in input use and prevailing market conditions.

5. Research Gap

Although seaweed farming has been extensively practiced in many parts of Indonesia, empirical studies that quantify the income and profitability of smallholder seaweed farmers remain limited. This study seeks to address that gap by providing an in-depth analysis of income from *Eucheuma cottonii* farming in Central Mamuju Regency, using both qualitative and quantitative approaches.

3. Methodology

3.1 Research Design

This study employed a descriptive quantitative approach to analyze the income derived from *Eucheuma cottonii* seaweed farming in Central Mamuju Regency. The research aimed to identify the production costs, total revenues, and net income of seaweed farmers using structured field data and analytical tools.

3.2 Research Location and Period

The study was conducted in Kambunong Village, Karossa District, Central Mamuju Regency, West Sulawesi, Indonesia. This location was selected due to its active seaweed farming activities and the prominence of *Eucheuma cottonii* cultivation. The research was carried out over a two-month period, from July to August 2022.

3.3 Population and Sampling Technique

The population of the study consisted of 156 active seaweed farmers in Kambunong Village. The sample was determined using purposive sampling, which involves selecting respondents based on specific characteristics relevant to the research objectives—in this case, farmers actively cultivating *Eucheuma cottonii*. A total of 23 farmers (15% of the population) were selected as respondents, which is considered sufficient for small-scale economic studies in aquaculture (Neish, 2013).

3.4 Data Types and Sources

The data used in this research consisted of both **primary** and **secondary** data:

- **Primary data** were collected directly from the respondents through field observations, structured interviews, and questionnaires related to input costs, production volumes, selling prices, and net income.
- **Secondary data** were obtained from government publications, statistical reports from the Ministry of Marine Affairs and Fisheries, and related academic literature.

3.5 Data Collection Techniques

Data collection was conducted through the following techniques:

- **Observation:** Direct field observation was conducted to understand the cultivation practices and infrastructure used by farmers.
- **Structured Interviews:** Interviews were carried out using a pre-designed questionnaire to collect consistent and comparable data on production costs, revenues, and farming constraints.
- **Documentation:** Supporting data such as farm records, sales receipts, and local government reports were reviewed to validate primary data.

3.6 Data Analysis Method

The data analysis was conducted using income analysis to determine total costs, revenues, and net income generated by *Eucheuma cottonii* seaweed farming.

4. Results and Discussion

4.1 Socioeconomic Profile of Respondents

4.1.1 Age of Respondents

Age plays a crucial role in determining the capacity of individuals to adopt innovation and manage farming activities effectively. As shown in Table 1, the majority of seaweed farmers (52%) were in the productive age range of 38–45 years, indicating high potential for labor productivity and adaptability to seaweed farming innovations.

Table 1. Age Distribution of Seaweed Farmers

Age (Years)	Frequency	Percentage (%)
30–37	8	35.00
38–45	12	52.00
46–52	3	13.00

4.1.2 Educational Background

Education level influences the ability to adopt new farming practices and technologies. Table 2 reveals that most respondents (52%) had completed junior high school, followed by 26% who completed senior high school. Only 22% had completed primary education.

Table 2. Educational Level of Seaweed Farmers

Education Level	Frequency	Percentage (%)
Primary School	5	22.00
Junior High School	12	52.00
Senior High School	6	26.00

4.1.3 Family Dependents

The number of dependents impacts both the household economic burden and the availability of labor. Table 3 indicates that most respondents (65%) had 4–5 dependents, which can support labor-intensive farming activities.

Table 3. Number of Family Dependents

Dependents	Frequency	Percentage (%)
2–3	7	30.00
4–5	15	65.00
≥6	1	4.00

4.1.4 Farming Experience

Experience in farming enhances decision-making and efficiency. As shown in Table 4, 52% of respondents had 4–5 years of experience in seaweed farming, indicating a relatively well-established knowledge base.

Table 4. Farming Experience of Respondents

Years of Experience	Frequency	Percentage (%)
2–3	10	43.00
4–5	12	52.00
≥6	1	4.00

4.2 Production Performance

The amount of seaweed harvested per cycle varied across respondents. As illustrated in Table 5, 61% of farmers harvested between 401–500 kg per cycle, with production influenced by farming practices and seed quality.

Table 5. Average Production of Seaweed (*Eucheuma cottonii*)

Production (kg)	Frequency	Percentage (%)
250–400	6	26.00
401–500	14	61.00
501–600	3	13.00

4.3 Income Analysis

Table 6 presents the average cost, revenue, and net income derived from seaweed farming. The total production cost was IDR 5,904,706, comprising fixed and variable costs. The average production output was 420 kg per cycle, with a selling price of IDR 25,000/kg. Total revenue was IDR 10,496,739, resulting in a net income of IDR 4,595,294 per cycle.

Table 6. Seaweed Farming Financial Summary (per cycle)

Description	Value (IDR)
Total Revenue (TR)	10,496,739
Variable Cost (TVC)	1,550,522
Fixed Cost (FC)	4,354,184
Total Cost (TC = FC+VC)	5,904,706
Net Income (II = TR – TC)	4,595,294

These results demonstrate that seaweed farming, particularly *Eucheuma cottonii*, provides a viable source of income for coastal

communities. The relatively low production costs and high selling price of dried seaweed contribute to a profitable farming model.

5. Conclusion and Recommendations

5.1 Conclusion

This study concludes that seaweed (*Eucheuma cottonii*) farming in Kambunong Village, Central Mamuju Regency, is economically viable. The average net income of IDR 4,595,294 per production cycle indicates that seaweed cultivation significantly contributes to farmers' livelihoods. The findings also suggest that factors such as farming experience, education level, and family labor availability play essential roles in improving productivity and income.

5.2 Recommendations

- Knowledge Enhancement:** Farmers should be encouraged to attend training and extension services to improve their cultivation techniques and adopt best practices in seaweed farming.
- Access to Quality Inputs:** The availability of high-quality seeds and farming equipment should be improved through farmer cooperatives or partnerships with private sectors.
- Strengthen Market Linkages:** Support should be provided to build stronger linkages with processing industries to enhance bargaining power and ensure better prices for dried seaweed.
- Sustainable Practices:** Promote environmentally sustainable farming methods to ensure long-term productivity and maintain the ecological balance of coastal areas.

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