



## Revenue Risk Analysis of Seaweed Cultivation (*Kappaphycus alvarezii* and *Eucheuma spinosum*) in Bungin Permai Village, Tinanggea District, South Konawe Regency

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### Abstract

*This research was motivated by the number of seaweed farmers Kappaphycus Alvarezii and Eucheuma Spinosum who experienced a decrease in income due to the risks that occur starting from planting, maintenance, to harvest. The purpose of this study was to determine how the amount of risk that occurs during the cultivation of seaweed Kappaphycus Alvarezii And Eucheuma Spinosum, knowing the income of farmers cultivating seaweed Kappaphycus Alvarezii And Eucheuma Spinosum. The population in this study were seaweed farmers in Bungin Permai Village who cultivated seaweed totaling 52 people, using simple random sampling techniques where some members of the population were used as research samples. The variables in this study were the productivity and income of corn farming farmers. The analysis used in this study is the coefficient of variation obtained by the results of research showing that the risks that occur in cultivation such as damaged seeds, ice-ice disease, crop failure and accidents. can affect the income of seaweed farmers in Bungin Permai Village, so that the average income of Kappaphycus Alvarezii seaweed farmers is Rp. 3,864,282 / planting period and Eucheuma Spinosum seaweed farmers Rp. 2,340,921 / planting period. And the risk of income obtained by the type of kappaphycus alvarezii 0.026 and Eucheuma spinosum 0.030.*

**Keywords:** Risk, Income, Seaweed.



## INTRODUCTION

Indonesia as an archipelago has the potential of 26 million hectares of marine and coastal fisheries. Increasing aquaculture production is a mainstay to realize this vision (Hasnawi *et al.*, 2016). The priority aquaculture commodities that are targeted for increased production include seaweed (Subair and Haris, 2019). Seaweed is a marine and fisheries resource that for the last 5 years has begun to be developed by farmer/fishermen communities along the coast because in addition to easy maintenance it also has economic advantages (Putra, 2018). According to data from the Ministry of Marine Affairs and Fisheries (2021), Indonesia's wet seaweed production reached 9,323,259.28 tons. This production is the result of accumulation from various islands of Indonesian seaweed centers that are utilized for domestic and export needs.

The following table shows data on seaweed production in South Konawe Regency in 2019-2023:

**Table 1 Seaweed production data in South Konawe Regency  
from 2019 to 2023**

| Year | Volume (Ton) | Value (Rp)     |
|------|--------------|----------------|
| 2019 | 42 869.51    | 214 347 574.83 |
| 2020 | 33 550.00    | 167 750 000.00 |
| 2021 | 37 288.00    | 178 050 200.00 |
| 2022 | 37 385.90    | 261 701 300.00 |
| 2023 | 37 746.60    | 264 226 200.00 |

Source: Central Bureau of Statistics of Southeast Sulawesi

From the table above, it can be seen that seaweed production in South Konawe Regency, over the past 4 years, has continued to experience a fairly good increase. This can be seen in 2022-2023 there was an increase in seaweed production.

Income is all receipts in the form of money or in the form of goods originating from other parties or industrial products that are valued on the basis of a number of money from the current property (Suroto 2000: 26). Income is also called income, namely the rewards received by all households in the community in a country / region, from the delivery of factors of production or after carrying out economic activities (Tito, 2011).

According to Fadli *et al.* (2017) the constraints faced in seaweed farming agribusiness activities come from the low quality of human resources, the quality produced is not appropriate, low prices, and production fluctuations caused by crop failure at the on-farm level and high prices of cultivation inputs. Any type of business will not be separated from risk. The amount of risk

experienced by farmers depends on the courage to make a decision (Kurniati, 2015). Ratnaningsih (2005) said that decision-making patterns usually prioritize security rather than pursuing large profits, in other words, farmers are more oriented towards saving results. Such farmer behavior is one form that farmers prefer to avoid risk.

Based on the above background, the author compiled it through research entitled risk and income analysis of seaweed cultivation (*Kappaphycus Alvarezii* and *Eucheuma Spinosum*) cultivated in Bungin Permai Village, Tinanggea District, South Konawe Regency.

Research related to risk in agricultural businesses shows a variety of approaches in several countries and fields. Susanti et al. (2018) analyzed the behavior of seaweed farmers in Bungin Permai Village, South Konawe, finding the majority of farmers were risk averse (86.48%), with only a small proportion being brave (5.41%) or risk neutral (8.11%). Dewi et al. (2017) analyzed the seaweed farming system in the same location, revealing the business was profitable with an R/C ratio of 7.353. Lusiana et al. (2017) examined the income of Bungin Permai fishermen, where the uncertainty of fish prices had an impact on the instability of their income.

## METHOD

This population is partly seaweed farmers in South Konawe Regency. Sampling in this study was done by *simple random sampling* using the Slovin formula; as many as 52 seaweed farmers. The types of data used in this research are qualitative data and quantitative data. Data collection techniques used were interviews, questionnaires, and documentation. Data analysis methods used to determine costs, revenue, income, risk analysis and risk mitigation.

### 1. Analysis of seaweed farming business

- a. Seaweed aquaculture income is the difference between total receipts (TR) and the total cost of paddy rice farming formulated:

$$Pd = TR - TC$$

Description:

Pd = Seaweed cultivation income (Rp/ha/month)

TR = Total revenue of seaweed cultivation (Rp/ha/month)

TC = Total cost of seaweed cultivation (Rp/ha/month)

- b. Total revenue from seaweed cultivation is by transferring between the amount of seaweed production produced and the selling price of seaweed per kilogram (Soekartiwi, 2006), which is formulated:

$$TR = Y \times P_y$$

Description:

TR = Total seaweed revenue (Rp/ha/month)

Y = Total seaweed production produced (kg)

P<sub>y</sub> = selling price of seaweed per kilo (Rp/kg)

- c. The cost of external tools incurred by seaweed cultivation farmers in South Konawe district in farming activities, including labor costs, production facilities costs, and other costs (Suriatayah, 2015), which are formulated:

TC = FC + VC

Lightness:

TC = Total cost of seaweed cultivation (Rp/ha/month)

FC = Fixed Cost

VC = Variable Cost

## 2. Risk Analysis of Seaweed Cultivation

To find out the risk of cultivation can be known with descriptive analysis. This analysis uses the risks faced by farmers. While quantitative analysis is used to measure the risk of production, costs, and income by using the coefficient of variation as follows:

$$CV = \frac{s}{Q}$$

Description:

CV = Coefficient of variation

s = Standard deviation (standard deviation)

Q = Average value

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{x})^2}{n - 1}}$$

Where:

s = Standard Deviation

X<sub>i</sub> = income

$\bar{x}$  = average income

N = Number of samples

According to Hernanto, (1999) this shows that if CV > 0.5 then the production risk on the farm borne by farmers is getting bigger, while the value of CV, while the value of CV < 0.5 then farmers will be more profitable or break even. Where the coefficient of variation is a measure of variation that can be used to compare a distribution of data that has different units.



## RESULTS AND DISCUSSION

### Risks of Seaweed Farming

The success of a cultivation is highly determined by how the system is applied by farmers in seaweed cultivation so that there are no things that farmers expect such as risks that will occur in the process of seaweed cultivation that can harm farmers. Factors that are considered to have an influence faced by farmers are production costs. More production costs are incurred by farmers to provide production facilities such as seeds and medicines. Risks that occur in seaweed cultivation are caused by uncertain weather conditions, pest attacks and seaweed diseases.

1. Risk During Planting , based on the results of interviews with respondents, the risk that occurs during planting is the number of damaged seedlings, this is because during the process of moving seedlings from place to place so that there is a touch or something that hits the seaweed seedlings. Weather conditions can also affect seedlings that are ready to be stocked so that the seedlings can be affected by ice-ice plant disease or change color to white. The process of stocking seedlings can also pose risks such as falling off the boat, which can cause minor to serious injuries.
2. Risk During Maintenance , based on the results of interviews with respondents, the risks faced by farmers during the maintenance process are pests and diseases of seaweed plants which are risks that have a significant effect on farmers. Pests and diseases that exist in seaweed plants are ice-ice disease. Symptoms of seaweed affected by disease or pests are often marked by the color of seaweed that is pale or white. These diseases and pests occur due to weather factors and polluted seawater so that seaweed cannot grow properly.
3. Risks During Harvest , seaweed is harvested about 1-2 months from the planting period. The way seaweed harvesting is done is by taking all the stretches of rope in the sea by rolling it around and storing it on the boat. After that, it is brought ashore and the process of separating or cutting the seaweed is carried out so that it leaves only a short one. Seaweed that is ready for production will be separated to be processed again in the sun before finally being sold to collectors or buyers. And for the remaining seaweed or short seaweed will be made into seeds again to be cultivated again.

### Revenue Analysis

Seaweed cultivation income is obtained from total revenue minus total costs in a seaweed cultivation process. The high and low income is influenced by the high and low production yields and production costs incurred. In this study, the income in question is fixed costs, variable costs,



labor costs, total costs.

**Table 2 Analysis of Fixed Costs, Variable Costs, and Labor Costs of Seaweed Cultivation Farmers in Bungin Permai Village, South Konawe Regency, 2024**

| Cost Type     | Description       | Average                       |                          |
|---------------|-------------------|-------------------------------|--------------------------|
|               |                   | <i>kapphaphycus alvarezii</i> | <i>Eucheuma spinosum</i> |
| Fixed Cost    | Nylon rope        | 12.303                        | 8.846                    |
|               | Aqua bottle       | 13.842                        | 14.154                   |
|               | Boat              | 338.516                       | 291.667                  |
|               | Basin             | 6.080                         | 3.700                    |
|               | Total             | 372.027                       | 318.425                  |
| Variable Cost | Seaweed seedlings | 109.615                       | 113.462                  |
|               | Gasoline          | 2.184.615                     | 2.226.923                |
|               | Total             | 2.294.231                     | 2.340.385                |
| Labor Cost    | Planting          | 615.385                       | 553.730                  |
|               | Harvesting        | 1.678.846                     | 1.417.308                |
|               | Total             | 2.294.231                     | 1.971.038                |

Based on table 2 above, it can be described as follows;

1. It is known that the average total use of fixed costs incurred by seaweed cultivation in Bungin Permai Village, Tinanggea District, South Konawe Regency is Rp. 372,027 per growing season which is known from the average amount of depreciation costs of seaweed cultivation equipment. The highest expenditure of fixed costs is in the cost of boat depreciation of Rp.338,462 per growing season, the amount of boat depreciation costs is influenced by the frequent use used from the planting period to the harvest so that the boat maintenance is expensive. For the total average use of fixed costs incurred by seaweed cultivation in Bungin Permai Village, Tinanggea Subdistrict, South Konawe Regency is Rp. 318,425 per growing season which is known from the average amount of depreciation costs of seaweed cultivation equipment. The highest expenditure of fixed costs is in the cost of boat depreciation of Rp.291,667 per growing season, the amount of boat depreciation costs is influenced by the frequent use used from planting to harvesting so that boat maintenance is expensive.

2. It is known that the variable costs used are two, namely, seaweed seeds Rp. 109,615 used in one harvest season and gasoline Rp. 2,184,615. gasoline is very large expenditure due to the use of boats. Land area is also very influential in the fulfillment of seeds and also fuel so that the expenditure used is very large. For variable costs used two, namely, seaweed seeds Rp. 113,462 used in one harvest season and gasoline Rp.2,226,923. gasoline is very large expenditure due to the use of boats. Land area is also very influential in the fulfillment of seeds and also fuel so that the expenditure used is very large.
3. It is known that the average costs incurred in the cultivation of seaweed plants in Bungin Permai Village, Tinanggea District amounted to Rp 2,294,231 per growing season, which is known from the entire amount of costs incurred to carry out the process of cultivating seaweed plants. The largest amount of labor costs incurred is the cost of harvesting amounting to Rp 1,678,846 per growing season The amount of harvesting costs incurred is influenced by the amount of labor required. The amount of labor costs of each seaweed farmer respondent in Bungin Permai Village is different, this is influenced by farmers where the more land area managed, the greater the labor costs that will be incurred by seaweed farmers in Bungin Permai Village, Tinanggea District. For the average costs incurred in the cultivation of seaweed plants in Bungin Permai Village, Tinanggea District amounted to Rp 1,971,038 per growing season, which is known from the entire amount of costs incurred to carry out the process of cultivating seaweed plants. The largest amount of labor costs incurred is the cost of harvesting of Rp 1,417,308 per growing season The amount of harvesting costs incurred is influenced by the amount of labor required. The amount of labor costs of each seaweed farmer respondent in Bungin Permai Village is different, this is influenced by farmers where the more land area managed, the greater the labor costs that will be incurred by seaweed farmers in Bungin Permai Village, Tinanggea District.

**Table 3 Total Costs of Seaweed Farmers in Bungin Permai Village, South Konawe Regency in 2024**

| Cost type     | Average cost (IDR) / MT      |                          |
|---------------|------------------------------|--------------------------|
|               | <i>Kappaphycus alvarezii</i> | <i>Eucheuma spinosum</i> |
| Fixed costs   | 372.027                      | 318.425                  |
| Variable cost | 2.294.231                    | 2.340.385                |
| Labor cost    | 2.294.231                    | 1.971.038                |
| Total         | 4.960.489                    | 4.629.848                |

Based on table 3 above, it can be stated that;

1. The average costs incurred in the cultivation of *Kappaphycus alvarezii* seaweed in Bungin Permai Village amounted to Rp 4,960,489 per growing season, which was obtained from the entire amount of costs incurred to carry out the seaweed cultivation process. The costs incurred in the largest amount are labor costs and variables amounting to Rp2,294,231 per growing season. The magnitude of labor costs incurred due to the high wages and also the amount of labor required. And very high fuel variables resulted in greater costs incurred. The total cost of each seaweed farmer respondent in Bungin Permai Village is different, this is influenced by the amount of land area managed by farmers where the more land area managed, the greater the costs that will be incurred by seaweed farmers in Bungin Permai Village.
2. The average costs incurred in the cultivation of *Eucheuma spinosum* seaweed in Bungin Permai Village amounted to Rp 4,629,848 per growing season, which was obtained from the entire amount of costs incurred to carry out the process of seaweed cultivation. The costs incurred were variable costs amounting to Rp2,340,385 per growing season. The amount of variable costs incurred was due to the high cost of gasoline and the large number of seeds needed. The amount of costs of each seaweed farmer respondent in Bungin Permai Village is different, this is influenced by the amount of land area managed by farmers where the more land area managed, the greater the costs that will be incurred by seaweed farmers in Bungin Permai Village.

**Table 4 Revenue and Income Analysis of Seaweed Cultivation in Bungin Permai Village, South Konawe Regency, 2024**

| Type      | Ket              | Average cost (IDR) / MT      |                          |
|-----------|------------------|------------------------------|--------------------------|
|           |                  | <i>Kappaphycus alvarezii</i> | <i>Eucheuma spinosum</i> |
| Reception | Total production | 785 (kg)                     | 847 (kg)                 |
|           | Price            | 11,000 (Rp/kg)               | 8,000 (Rp/kg)            |
|           | Reception        | 8,632,462 (Rp)               | 6,778,462 (Rp)           |
| Revenue   | Total cost       | 4.960.487                    | 4.629.848                |
|           | Reception        | 8 824.769                    | 6.970.769                |
|           | Total            | 3.864.282                    | 2.340.921                |

Table 4 above illustrates that;

1. The average revenue of *Kappaphycus alvarezii* seaweed cultivation per growing season in Bungin Permai Village, Tinanggea District, South Konawe Regency is Rp. 8,632,462 / growing season with an average production of 785 kg / growing season and a selling price of Rp. 11,000 / Kg. For the acceptance of *Kappaphycus alvarezii* seaweed cultivation per growing season in Bungin Permai Village, Tinanggea District, South Konawe Regency amounted to Rp. 6,778,462 / growing season with an average production of 847 kg / growing season and a selling price of Rp. 8,000 / Kg.
2. The average income of *Kappaphycus alvarezii* Seaweed Cultivation Farmers in Bungin Permai Village, South Konawe Regency is IDR 3,864,282 / growing season and the average revenue of IDR 824,769 / growing season and the average total cost of IDR 4,960,487 / growing season. Income of *Eucheuma spinosum* Seaweed Cultivation Farmers in Bungin Permai Village, South Konawe Regency amounted to Rp2,340,921 / growing season and average revenue of Rp. 6,970,769 / growing season and average total costs of Rp. 4,629,848 / growing season. High and low income is influenced by production yields and production costs. One of the things that affects production is the weather that always changes and can cause seaweed production to be less than optimal. So that it can cause disease to seaweed plants.

### Revenue Risk Analysis

Income risk is analyzed by the coefficient of variation. A small coefficient of variation indicates that the variability of the mean value of the distribution is low. This illustrates that the risk faced is small. The income risk analysis on seaweed cultivation in Bungin Permai Village, South Konawe Regency can be seen in Table 5.

**Table 5 Income Risk Analysis of Seaweed Cultivation in Bungin Permai Village, South Konawe Regency in 2024**

| Description                   | Seaweed (Rp/MT)              |                          |
|-------------------------------|------------------------------|--------------------------|
|                               | <i>kappaphycus alvarezii</i> | <i>Eucheuma Spinosum</i> |
| Average income (IDR)          | 3.864.282                    | 2.350.218                |
| Standard deviation (Rp)       | 100.812                      | 71.613                   |
| Coefficient of variation (CV) | 0,026                        | 0,030                    |

Source: Primary Data Processed, 2024

Based on table 5 above, the income risk analysis for both types of seaweed can be

described as follows;

1. The income of *Kappaphycus alvarezii* seaweed cultivation farmers in Bungin Permai Village, Tinanggea District, South Konawe Regency is Rp 3,864,281 per planting period. From the analysis of the calculation of income, it can be known the amount of standard deviation of seaweed as much as Rp 100,812 per planting period. The coefficient of variation obtained based on calculations by comparing the average income with a standard deviation of 0.026. The coefficient of variation is less than 0.5 ( $0.026 < 0.5$ ). The results of the analysis show that the income risk of seaweed cultivation farmers *Kappaphycus alvarezii* in Bungin Permai Village Tinanggea District South Konawe Regency is classified as low risk. Based on the theory of Hernanto (1999) states that if the Coefficient of Variation  $> 0.5$ , the farming risk borne by farmers is getting bigger, while the value of the Coefficient of Variation is 0.5, farmers will always make a profit or break even. While farmers in the research location there are risks faced such as uncertain weather at the time of drying seaweed can still be controlled by not drying seaweed so as not to be damaged or white.
2. The income of *Eucheuma Spinosum* seaweed cultivation farmers in Bungin Permai Village, Tinanggea District, South Konawe Regency is Rp 2,350,218 per planting period. From the analysis of the calculation of income, it can be known the amount of standard deviation of seaweed as much as Rp 71,613 per planting period. The coefficient of variation obtained based on calculations by comparing the average income with a standard deviation of 0.030. The coefficient of variation is less than 0.5 ( $0.030 < 0.5$ ). The results of the analysis show that the income risk of seaweed cultivation farmers *Kappaphycus alvarezii* in Bungin Permai Village Tinanggea District South Konawe Regency is classified as low risk. Based on the theory of Hernanto (1999) states that if the Coefficient of Variation  $> 0.5$ , the farming risk borne by farmers is getting bigger, while the value of the Coefficient of Variation is 0.5, farmers will always make a profit or break even. While farmers in the research location there are risks faced such as erratic weather at the time of drying seaweed can still be controlled by not drying seaweed so as not to be damaged or white in color.

## CONCLUSION

Based on the results of the discussion in the research on Risk and Income Analysis of Seaweed Cultivation (*Kappaphycus Alvarezii* and *Eucheuma Spinosum*) in Bungin Permai Village, Tinanggea District, South Konawe Regency, it can be concluded that the risks faced by farmers of *Kappaphycus Alvarezii* and *Eucheuma Spinosum* Seaweed Cultivation in Bungin Permai Village,

Tinanggea District, South Konawe Regency are income risks. The risk of *Kappaphycus Alvarezii* seaweed income is obtained from the coefficient of variation (CV) value of 0.026 and *Eucheuma Spinosum* seaweed is obtained from the coefficient of variation (CV) value of 0.030. This means that if  $CV > 0.5$  then the risk of farm income borne by farmers is getting bigger, while the value of  $CV \leq 0.5$  then farmers are always profitable or break-even.

The average income of seaweed farmers *Kappaphycus Alvarezii* type of Rp. 3,864,282 / planting period is greater than the seaweed farmers *Eucheuma Spinosum* type of Rp. 2,340,921 / planting period. This is due to the different selling prices between the two types of seaweed.

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