Feasibility Study of Sea Cucumber Cultivation Investment in Karimunjawa Islands, Jepara Regency

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Abstract. The study of sea cucumber cultivation investment in Karimunjawa Islands is one of the efforts for investment promotion in the study region. This study will make the investment opportunities become more focused and sharp, so it will be easier for investors to execute their investment interest. The purpose of this study is to provide initial information for investors about business opportunities of Sea Cucumber farming as a very feasible investment opportunity. The method used in this study was the survey method, and descriptive analysis was conducted to access investment opportunities. The result showed that the feasibility of Sea Cucumber cultivation has scored higher than 1, that means the activity was feasible. The financial analysis showed that investment of sea cucumber cultivation in Karimunjawa Islands, Jepara regency is very prospective and has a fairly high chance to succeed as a business investment. This can be seen from benefit-cost ratio (BCR) = 1.87; BCR > 1 ; ROI (Return Of Investment) = 67.98 %; Payback Period is 10.29 months; the Net Present Value (NPV) > 0 is equal to 21,027.571, and Profitability Index (PI) value greater than 1, which is 1,957321706; IRR (Internal Rate Of Return) = 38 %. It can be concluded that all these choices on the investment plan are feasible to run and to obtain more prospective advantageous. All examined aspects of Sea Cucumber cultivation in Karimunjawa Islands, Jepara regency gave results that investment activity is able to be executed.

1. Introduction
The district of Karimunjawa is one of the eight coastal districts in Jepara regency[1]. It has a total area of 111,625 ha. The district has been established as the conservational area on 9 April 1986 through Forestry Minister decree No. 123/kpts-II/1986 as marine nature reserve due to its high coral diversity and coral type specification and its biota components. In its development, Karimunjawa island is established as a national park through Forestry Minister decree No. 161/Menhut-II/1998 followed by Foreign and Plantation Minister decree No. 78/KPTS-III/1999. Then, Dirjen PHKA Decree No. 79/IV/Set-3/2005 on Karimunjawa National Park zoning revision which then is affirmed by Dirjen PHKA Decree No. 28/IV/PHPA/2012 on Karimunjawa National Park zoning[2].

The district of Karimunjawa has marine resources potential in capture fisheries and marine aquaculture[2;3]. Karimunjawa is a strategic economic development region, especially economic resources in Jepara regency, it is because it has potential resources in large pelagic fish, small pelagic, demersal fish, reef fish, penaeid shrimp, lobster, sea cucumber and squid[1;2;3]. However, such potential has not been managed optimally due to the limited human resources. Taking a look at the characteristic of Karimunjawan waters, physically and chemically, the island is having quite the
potential for sea culture development of economically strategic species such as seaweed, reef fish, green mussels, pearl shells, and sea cucumber with promising results[2;3].

Sea cucumber cultivation is a superior fishery commodity with good economic value with broad market range locally and with export orientation[3]. Karimunjawa region is quite promising for the development of sea cucumber agribusiness. This is supported by water area of 11,625,000 Ha where 7,888,213 Ha of it can be utilized for sea cultivation. Due to high market demand for sea cucumbers, therefore sea cucumbers are bad exploited with environmentally unfriendly means. Local government is need to develop local business man and foreign investor interest to cultivate sea cucumbers[4]. The attempt to cultivated of sea cucumber has been done in a number place in the world such as, California, New Papua New Guinea, Fiji and Australia [5;6;7;8;9] Since the sea cucumber fishery is still in its early stages of development, extensive feasibility research into best processing technology, product development, human resources, and market study is necessary[10].

Currently, sea cucumbers demand depends on fishing results, and therefore may not be sustainable environmentally[5;6]. The lack of concrete information on the feasibility of sea cucumber cultivation that may convince the community and foreign investor to cultivate, and it makes this effort under-developed. Feasibility of a floating cage culture of grouper fish investment in Karimunjawa has been studied [11]. However, there has not been any research on the investment feasibility of fisheries sub-sector sea cucumber cultivation. This may be the factor why Karimunjawa islands have not Developed the sea cucumber cultivation yet. Therefore, such investment research is strategically important and urgent to be conducted.

2. Research methods
The method employed for this research is survey. The approach being used to achieve the research purpose is through primary and secondary data [12, 13]. The primary data is obtained by survey result and field observation through the interview with the respondent. The secondary data are obtained from previous research results and/or institutional reports. The needed data to write this investment profile may include production potential, domestic and export demand, natural and human resources availability, and product value and price for domestic and export market. Further data are analyzed in accordance with the purpose of research, the feasibility analysis through the calculation of Net Present Value (NPV); Net B/C Ratio, Internal Rate of Return (IRR); Rate of Return On Investment (ROI); and Payback Period (PBP) [12;14]. In determining the financial feasibility of marine cultivation, the formula of [16] is employ, as shown below:

1. Capital (total investment) = Fixed capital + working capital
2. Total cost = fixed cost + variable cost
3. Gross income = total production (Q) x Price (P)
4. Net income = income – total cost
5. Investment criteria:

In line with the purpose of this activity, the approach of competitiveness analysis is employed, continued by feasibility analysis by calculating the net present value (NPV); net B/C Ratio, internal rate of return (IRR), rate of return on investment (ROI), payback period (PBP), and break even point (BEP). Mathematically, the formula for each of the above criteria is explained as follows:

2.1. Payback period (PBP)
PBP is used to calculate the return of capital time period with the formula of:

\[
\text{Payback Period} = \frac{\text{Investment value}}{\text{Net cash in a value}} \times 1 \text{ year} \tag{1}
\]

Where payback period based on the time value of money is:

\[
\text{Current PBP value} = \frac{\text{Investment value}}{\text{Net cash inflows present value}} \times 1 \text{ year} \tag{2}
\]

The faster the payback period is, the better the business is.
2.2. Net Present value (NPV)
NPV is the amount of the present value of net cash flows after deducting the initial investment value, formulated as:

\[ NPV = \sum_{i=1}^{n} \frac{Bi-Ci}{(1+r)^i} \]  

Where:
- \( B \) = net cash flow per year during the analysis period
- \( C \) = initial investment
- \( r \) = Discount rate per year
- \( i \) = Time period of the project

Conclusion:
- If \( NPV > 0 \) \( \rightarrow \) Feasible
- If \( NPV < 0 \) \( \rightarrow \) Not Feasible

2.3. Internal rate of return (IRR)
IRR is used to calculate discount rate (interest rate) which equates the present value of net cash inflows with the initial investment value. IRR may also be used to calculate the discount rate that affects NPV into equals to zero. IRR is formulated as below:

\[ \sum_{t=0}^{n} \frac{CF_t}{(1+r)^t} = 0 \]  

Where:
- \( r = IRR \) = (discount rate that enables \( NPV = 0 \))

Characteristics:
1. If IRR is larger or equals capital cost, then the project may be accepted. This is because IRR is the expected profit rate of a project, and capital cost is the required profit rate. Therefore, if IRR is higher than the capital cost, it means that the project may fund the cost of capital and still produces interest surplus for business owners.
2. If IRR equals project capital cost, then the project is expected to generate revenue to the amount required by business owners.

2.4. Benefit-cost ratio (BCR)
the ratio of the amount of the present value of benefits and costs, the formula is:

\[ B - C Ratio = \frac{\sum_{t=1}^{n} \frac{Be}{(1+r)^t}}{\sum_{t=1}^{n} \frac{Ce}{(1+r)^t}} \]  

Description:
- \( B \) = net cash flow per year during the analysis period
- \( C \) = initial investment
- \( r \) = weighted average capital costs
- \( t \) = project lifespan

Conclusion:
- If \( BCR > 1 \) \( \rightarrow \) Feasible
- If \( BCR < 1 \) \( \rightarrow \) Not Feasible

Notes: If the calculated BCR is not feasible, but socially giving a positive impact on communities then the project may be considered as feasible, and business activity may be continued.

2.5. Break even point (BEP)
BEP quantity = \( FC : (P/unit - VC/unit) \)
BEP rupiah = \( FC : (1 - (VC/P)) \)
3. Results and Discussion

The potential of natural resources owned by Karimun Jawa Islands is the appropriate location of its allocation and meets the technical and ecological requirements for the cultivation of sea cucumber. These requirements are the key factors determining the success of sea cucumber cultivation.

According to Director General of Forest Protection and Nature Conservation, Ministry of Forestry No. 28 / IV-Set / 2012 About Karimunjawa National Park zoning, the space available for cultivation is in Marine culture Utilization zone covering an area of 729 Ha, 1.70. includes the area of Karimunjawa Island, of Kemujan Island, Menjangan Besar Island, Parang Island, Nyamuk Island and North Karang Besi Island[2].

From the location which is in accordance with the allocation based on the consideration of security and operational ease in floating cage should be the ideal location. That is located at a distance of 1 kms of coastline[2:13]. The feasibility of potential sea cultivation location developed for fish cultivation in floating cage area of 150,14 ha. The development of cultivation is expected to keep the sustainability and sustainable principles in mind. To that end, the existing potential should not be exploited fully, but the reserved area that serves as a buffer to suppress the effects of environmental degradation. This buffer area can be created by arranging the number of floating cage units. [14]. Suggested the placement of floating cage number of units are ideal in the cultivation zone is not more than 10% of the ideal.

The observational result on the potential for broodstock of sea cucumber in Kemujan region, there are 14 species where 8 of them has economic value. They are Holothuria leucospilota, Holothuria scabra, Holothuria nobilis, Sticopus impatiens, Sticopus variegates, Stichopus horrens, Bohadschia sp, and Bohadschia vitiensis. In the region of Karimunjawa, there are 14 sea cucumber species where 9 of them has economic value, which are Holothuria leucospilota, Holothuria scabra, Holothuria impatiens, Stichopus Sp, Stychopus.Sp.B, Stichopus. Sp.C, Bohadschia Sp.1, Bohadschia Sp.2, and Bohadschia vitiensis. The observation result is dominated by Holothuria atra which is the cheapest variety and there is only one high-value type (Holothuria scabra) which was found in Menjangan Besar station.

3.1. Financial feasibility

The downstream of a business is then determined by a financial factor. Every element of activity from the market, technical, and management aspect will be quantified on its monetary unit to determine the number of funding needs and how to fulfill it. In addition, the projection of operational result will determine the extent of financial benefit gained from the business. The financial feasibility calculation for this project can be seen in this Table below:

**Table 1. Investment Cost for Sea Cucumber Cultivation in Karimunjawa Island**

| No.  | Material                  | Unit  | Amount | Unit price (Rp) | Total (Rp) |
|------|---------------------------|-------|--------|----------------|------------|
| 1.   | Wooden Peg                | Unit  | 30     | 30,000         | 900,000    |
| 2.   | Wooden board              | Sheet | 20     | 50,000         | 1,000,000  |
| 3.   | Ris rope                  | Kg    | 10     | 20,000         | 200,000    |
| 4.   | Nets                      | Kg    | 3      | 10,000         | 30,000     |
| 5.   | Wood saws                 | Unit  | 2      | 15,000         | 30,000     |
| 6.   | Machete (chopping Knife)  | Unit  | 2      | 20,000         | 40,000     |
| 7.   | Shovel                    | Unit  | 2      | 25,000         | 50,000     |
| 8.   | Hammer                    | Unit  | 2      | 15,000         | 30,000     |
| 9.   | Mask                      | Unit  | 2      | 35,000         | 35,000     |
| 10.  | Net                       | Kg    | 120    | 75,000         | 9,000,000  |
| 11.  | Straps                    | Roll  | 3      | 50,000         | 150,000    |
| 12.  | Generator set             | unit  | 1      | 3,500,000      | 3,500,000  |
| 13.  | Boat                      | Unit  | 1      | 7,000,000      | 7,000,000  |
|      | **Investment total**      |       |        |                | **21,965.00** |
Table 2. Total Cost (Production/Operational) of Sea Cucumber Cultivation in Karimunjawa Island

| No. | Detail                      | Unit | Amount | Unit Price (Rp) | Total (Rp) |
|-----|-----------------------------|------|--------|-----------------|------------|
| 1   | Fence making wage          | Days | 5      | 40,000          | 200,000    |
| 2   | Seed                        |      | 7500   | 7,500           | 56,250,000 |
| 3   | Additional feed             | Kg   | 2000   | 1,500           | 3,000,000  |
| 4   | Labour                      | People | 1   | 1,000,000      | 7,000,000  |
| 5   | Investment Depreciation     | Year | 5      | 4,230,000       |            |
| 6   | Cultivation treatment       | Packet | 1   | 500,000         | 1,000,000  |
| 7   | Fuel                        | 2x30 | 7      | 7,500           | 3,150,000  |
| 7   | Drying costs                | Packet | 1   | 2,000,000      | 2,000,000  |

Production Cost Total: 76,830,000

Table 3. Revenue Details (Rp)

| No. | Detail       | Unit | Amount | Unit Price (Rp) | Total (Rp) |
|-----|--------------|------|--------|-----------------|------------|
| 1   | Sales Result | Kg   | 120    | 1,200,000       | 144,000,000 |
|     |              |      |        |                 | Gross Revenue 144,000,000 |

Net Income = Revenue – total cost
= Rp. 144,000,000 – Rp. 76,830,000
= Rp. 67,170,000,-
Capital = Fixed capital + Working capital
= Rp. 21,965,000 + Rp. 76,830,00 |
= Rp 98,795,000,-

Benefit Cost of Ratio (BCR) = Revenue/Total cost
= Rp. 144,000,000: Rp. 76,830,000 = 1.87  BCR > 1,
Therefore, sea cucumber cultivation business in Karimunjawa is worth the investment
Use of capital efficiency based on the ROI (Return Of Investment) :
= Profit/Capital x 100%
= (Rp. 67,170,000: RP 98,795,000x 100 % = 67.98 %
The higher the ROI, the more efficient the use of capital
Payback period, measured with Payback Period of Capital (PPC)
PPC = Capital/Profit x production period (month)
PPC = (Rp 98,795,000: Rp. 67,170,000) x production period
PPC = 1,34 X 7 month
PPC = 10,29 month
Criteria: smaller PPC rate is better
From criteria, it can be said that the sea cucumber cultivation investment is financially feasible.
Furthermore, the assessment includes financial projection as follows:
Initial investment and funding sources:
The tangible fixed assets required including machinery and equipment
Table 4. Initial investment of sea cucumber cultivation

| No | Detail                  | Amount  |
|----|-------------------------|---------|
| 1  | Boat                    | 7,000,000 |
| 2  | Machine                 | 3,500,000 |
| 3  | Tools (Pencage)         | 11,465,000 |
|    | **Total**               | **21,965,000** |

To fund the initial investment, an adequate funding source is required. The planned funding sources include debt (70%), and personal capital (30%).

3.2. Net cash flow projection and investment Assessment
The capital investment represents the amount of investment in tangible and intangible fixed assets and interest costs during the construction period. This capital investment is considered as Initial Investment, namely all expenses before the operation is carried out. The detailed projection of net cash flows is available on the appendix, while the summary of net cash flow projection can be seen in the Table below:

Table 5. Net cash flow projection sea cucumber cultivation investment

| Period (Years) | Net cash flows | Discount factor | Net cash flows Present Value |
|----------------|----------------|-----------------|----------------------------|
| Pre-operational| 21,965,000     |                 | 21,965,000                 |
| I              | 4,747,271      | 1,1727          | 3,815,358                  |
| II             | 4,474,271      | 1,375,225,29    | 3,049,999                  |
| III            | 3,914,602      | 1,612,722,6698  | 2,427,319                  |
| IV             | 3,634,768      | 1,891,214       | 1,921,892                  |
| V              | 7,479,241      | 2,214,802,54    | 1,770,800,2                |

Net Present Value (NPV) 21,027,571
Profitability Index (PI) 1,957,321,706
Internal Rate of Return (IRR) 38 %

Based on the analysis it can be concluded that overall, this investment is quite prospective and have a high business opportunity with a high chance of success, and may also be increased in the future. This can be seen on the Net Present Value (NPV) or the difference between Present Value from Net Cash Flow and Initial Investment (Io) > 0 at Rp. 21,027,571 and Profitability Index (PI), which is the current value of net cash revenue in the future with investment value higher than 1, which is 1,957,321,706. The analysis concludes that the investment plan is feasible and profitable. The investment on sea cucumber cultivation in Jepara Regency is feasible for the investors. The analysis also provides a strong business case for continuing development and investment in the sea cucumber fishery.

4. Conclusion
The study concluded that sea cucumber cultivation investment in Karimunjawa Islands Jepara regency is quite prospective and have a high opportunity with a high chance of success. Based on Net Present Value (NPV) and Profitability Index (PI) analysis, the investment of sea cucumber cultivation is feasible and profitable.
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