

Financial analysis of seaweed, *Kappaphycus alvarezii*, farming business toward farmer's income development in Minahasa Penninsula, North Sulawesi, Indonesia

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Abstract

This study was carried out in the present farming sites of *Kappaphycus alvarezii* in Minahasa penninsula, Jayakarsa village of North Minahasa, Sondaken of South Minahasa, Buku Tengah of Southeast Minahasa, and Tumpaan of Minahasa Regencies. It was aimed to know the farming system and financially analyze whether the farming business is feasible or not. Data were collected through observations, questionnaires and interviews. Literature reviews and financial analyses were also done to know the revenue, the feasibility of seaweed, *K. alvarezii*, farming business and its development. The farming system in Minahasa penninsula generally used longline method. It is used because of being resilient to strong wind, cheap, and easily implemented and long lived so that the line could be repeatedly used up to 4-5 years. Financial analyses found that among 4 study sites, the highest B/C ratio was recorded in North Minahasa, 6.06, followed by South Minahasa, 2.75, then Southeast Minahasa and Minahasa, 1.67, and BEP values were also different among regencies. Furthermore, NPV, IRR, ROI and PP of all study sites belonged to feasible criteria for development. Different conditions among regencies resulted from different geographic conditions affected the planting system.

Keywords: *Kappahycus alvarezii*, financial feasibility, Minahasa peninsula

INTRODUCTION

Seaweeds, *Kappaphycus alvarezii* is one of potential maricultural commodities with competitive market economic values. North Sulawesi Province is also a potential and strategic seaweed farming area consisting of penninsula and islands with a coastal line of about 1,837 km (Reslian, 2010), North Minahasa, Minahasa, Southeast Minahasa, and South Minahasa Regencies. (Pamungkas, 2013).

Potential area for seaweed, *K alvarezii*, culture in Minahasa Penninsula is big enough

but its utilization is not maximally done yet so that contribution to the development and economy of North Sulawesi province and living standard improvement of the seaweed farmers is not optimal yet. High market demand for *K. Alvarezii* results in rapid development of its culture in the potential areas in North Sulawesi Province. *K. alvarezii* culture people practiced in Minahasa penninsula does not continuously occur, and therefore, it is interesting to study in order to know the site condition, from economic aspects, culture system and its business feasibility.

Financial analysis of the present seaweed farming activities in Minahasa peninsula was aimed at knowing clearly the investment needed to run the seaweed farming over a planting season or one-year period. Through the financial analysis, it is expected to be able to know the capital needed, the profit gain, and the time needed to obtain the break even point. This outcome is also expected to be beneficial for the seaweed farmers and the government as a reference to the development effort of *K. alvarezii* farming, particularly in Minahasa peninsula.

This study was carried out in 4 farming sites in Minahasa peninsula waters: (1) Jayakarsa village, East Likupang District, North Minahasa Regency, (2) Sondaken, Tatapaan District, South Minahasa regency, (3) Buku Tengah, Belang District, Southeast Minahasa Regency, and (4) Tumpaan, East Lembean District, Minahasa Regency, from November 2014 to January 2015.

Data were collected through observations, interviews and questionnaires and descriptively analyzed. The observation was carried out in the areas where *K. alvarezii* farming business occurred, and the respondents were the seaweed farmers. Financial analysis is required to know the feasibility of the seaweed farming business as an income source. It covers the capital for farming facility investment and production cost, such as seed, labor wage, maintenance and transportation costs during the culture period. These expenditures were accumulated and calculated against the selling price of the products.

In this study, a simple business analysis was used following Sugiarto and Herlambang (2005) as follows:

Total Cost (TC)

$$TC = TFC + TVC$$

Where TC = total cost, TFC= Total fixed cost, and TVC= total variable cost

Total Revenue (TR)

$$TR = P \times Q$$

Where P = price and Q = quantity

Profit

$$\Pi = TR - TC$$

Where TR = Total revenue and TC = total cost

If π is positive, the investment is considered feasible, and if π is negative, the investment is not feasible.

Moreover, to know clearly the investment feasibility, several other measures were used

1. Benefit Cost Ratio B/C ratio

Benefit Cost Ratio is the simplest analysis to record business feasibility (Idriani and Sumiarsih, 2003). The value of B/C ratio is obtained using the following formula:

$$B/C = \frac{\text{Selling price}}{\text{Production capital}}$$

B/C = 1, means the business is not profitable and needs improvement, < 1 means not economic, and > 1 is not feasible.

2. Break Event Point (BEP)

BEP is an analytical tool to know the limit of production value or volume of the business to reach the break even point. BEP

calculation use the following formula (Kordi, 2011):

$$\text{BEP}_{(\text{IDR})} = \frac{\text{total cost}}{\text{selling price}}$$

$$\text{BEP}_{(\text{kg})} = \frac{\text{total cost}}{\text{unit price}}$$

3. Payback period (PP)

Payback period is a length of time needed to return the investment cost or total expenditure is similar to total revenue. The investment will be feasible if the payback period is lower than that requisited (Sofyan, 2002). Payback period was calculated following Ismail and Supriono (2013).

i. If the cash flow is the same every year :

$$\text{PP} = \frac{\text{initial investment}}{\text{cashflow}} \times 1 \text{ year}$$

ii. If the cash flow is different every year :

$$\text{PP} = n + \frac{a-b}{c-d} \times 1 \text{ year}$$

where

n = final year in which the cash flow has not reached the initial investment

a = initial investment

b = cummulative cash flow at year n

c = cummulative cash flow at year n+1

with criteria (Riyanto, 2010).:

Payback Period < 3 years : the capital return is fast

Payback Period of 3 -5 years: the capital return is moderate

Payback Period > 3 years: the capital return is slow.

4. Net Present Value (NPV)

Net Present Value is used to measure the revenue obtained from present investment in the business period. Business feasibility was assessed following Sofyan (2002):

$$\text{NPV} = \sum \text{NPV} = \sum_{t=1}^n \left(C \frac{\text{CF}_t}{[1+r]^t} - I_0 \right)$$

Where

NPV = Net Present Value

t = Time period or year t

Criteria:

- NPV positive, the investment is feasible

- NPV negative; the investment is not feasible

5. Internal Rate of Return (IRR)

Internal Rate of Return is an analytical method of measuring business feasibility by comparing the interest rates that make the present value of cash outflow and inflow the same under the present interest rate (i). IRR could be considered as the profit rate of the business net investment as long as each net benefit automatically gained is reinvested in the next year and get the same profit rate and obtain interest for the rest of the business period.

The investment is feasible if IRR exceeds the requisited return rate. IRR can describe the extent of interest rate and return rate over the invested capital. In investment criterion, IRR must be higher than Opportunity cost of Capital (OCC) that the investment plan could be feasible (Sofyan, 2002).

6. Analisis Rate of Return on Investment (ROI)

ROI or investment profit is the ratio of gain and loss in an investment. The amount of money lost could be called as interest or benefit/loss. The investment of money can be assumed as an asset, capital, and investment cost. ROI does not give indication of investment period, but it is often expressed in annual unit.

ROI calculation used Indrani and Suminar (2003)

$$\text{ROI} = \frac{\text{Net gain} \times 100\%}{\text{Total cost}}$$

RESULT AND DISCUSSION

Farming System

Farming method in all farming sites of Minahasa penninsular waters was relatively similar, using long line withdrawn on the surface. This method was adopted from monoline system practiced by Phillipness seaweed farmers in Tawi-tawi (Posadas, 1988 in Nerisa, *et al.* 1991), since it is simple and low cost. Planting was initiated with tying the seaweed seed on the plastic line sticked to the main line. Placing the seaweed seed was done in the shaded area of direct sunlight, in the coast under the tree or house in general. The seed weight varied from 150 to 200 gram per twig, inter-twig distance from 15 to 30 cm and distance between main lines from 2.5 to 3 m (Table 1).

Difference in planting system was done to situate with the study site of *K. alvarezii* culture that possesses different geographic position affecting each site. Main factor influencing the planting system is wave. It

was also mentioned (Indriani and Sumiarsih, 1999) that rearing the seaweed, *K. alvarezii*, required several prerequisites in relation with site selection. For those directly facing the open sea, fringing reefs are needed to protect the plant from strong wave strikes. Strong waves in Minahasa waters often caused the inter-seed planting distance shift closer to 15 cm. This close distance is expected that when the seaweed growth occurs the seaweed will be joining each other to form stronger clumps that are more sustainable to strong waves so that they are not easily taken off or lost from the wave strikes.

2. Financial Analysis

Water conditions affect the planting system and cycle which will also influence the investment cost. Planting patterns varied from 4 to 6 times per year depending upon the nature conditions at each area, and therefore, this study analyzed total cost, depreciation, revenue, and profit over each production. The financial analysis of the macroalga, *K. alvarezii*, farming for 1 Ha is presented in Table 2. Table 2 shows different investment need for each location of *K. alvarezii* farming business in Minahasa Penninsula. Nevertheless, these differences give positive profit (Π) so that this business is feasible to develop.

Based on the investment value, all sites give different positive profit. TFC analysis in 4 farming sites shows nearly same investment need, but TVC could be different depending upon the local people's wage that affects the total cost (TC). The highest TR found in Minahasa Regency resulted from more seeds used than other sites due to shorter tying distance, 15 cm, than other sites,

20-30 cm, even though tying distance may not be followed by the extent of profit rate (Gahaube, *et al.* 2013). To develop the business through bank loan under an interest rate of 19.5% per year is given by financial analysis in Table 3.

B/C ratio > 1 means all farming sites are feasible to run the seaweed farming business. Break even point (BEP) is achieved when the average production is 356.06 kg (IDR 4,984,29.51) for North Minahasa, 495.46 kg (IDR 6,936,451.14) for Southeast Minahasa, 490.11 kg (IDR 6,861,489.49) for Minahasa and 270.05 kg (IDR 3,780,742.9) for South Minahasa.

Based on the data recapitulation above, it was found that the gain of each *K. Alvarezii* farming in Minahasa penninsula varied. The highest feasibility was recorded in North Minahasa Regency, West Likupang District, with a B/C ratio of 6.06, followed by South Minahasa, 2.75, Minahasa, 1.67, and Southeast Minahasa, 1.64, respectively. The break even points obtained in Minahasa Penninsula were different. Payback period is categorized fast due to less than 3 years. The present study found that the investment could be returned in less than 1 year, 0.08 year for south Minahasa, 0.09 year for North Minahasa and Minahasa, and 0.13 year for Southeast Minahasa. Since the farming asset, such as line, net, anchor and float, could be used for 4 years, the highest average NPV per year could be gained as much as IDR 104,734,800.00, in North Minahasa, IDR 86,614,000.00 in South Minahasa, IDR 84,669,100.00 in Minahasa, and IDR 53,515,500.00 in Southeast Minahasa.

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The highest profit of the investment was found in North Minahasa, with IRR of 45.81%, followed by South Minahasa, 33.82%, Minahasa, 31.85% and Southeast Minahasa, 30.62%. The amount of investment return over a year was 52.37% for North Minahasa, then Southeast Minahasa, 41.08%, South Minahasa, 40%, and Minahasa, 35%, respectively. Large-scale farming business development is highly possible but it needs government participation or private sectors in providing working capital that high availability of potential farming area could be maximally utilized.

Table 1. Planting system

Planting System	North	South	Southeast	Minahasa
	Minahasa	Minahasa	Minahasa	Minahasa
Main line length (m)	100	100	100	100
Seed weight (gr)	200	150	200	200
Seed distance (cm)	20	25	20	15
Main line distance (m)	3	2,5	3	2,5
Number of twigs	500	400	500	666
Number of seeds (kg)	3400	2400	3400	5328
Planting season	5-6 times	5-6 times	4-5 times	4-5 times

Table 2. *K. alvarezii* farming investment for 1 Ha area

NO	Investment	Value (IIDR)			
		North Minahasa	Southeast Minahasa	Minahasa	South Minahasa
1	Total Fix Cost (TFC)	5,566,000.00	7,460,000.00	5,710,000.00	6,570,000.00
2	Total Variable Cost (TVC)	19,050,000.00	20,300,000.00	28,462,000.00	12,100,000.00
3	Total Cost (TC)	24,616,000.00	27,760,000.00	34,172,000.00	18,670,000.00
4	Total Revenue (TR)	35,359,220.00	34,082,000.00	50,082,400.00	24,958,000.00
5	Profit (II)	10,743,220.00	6,322,000.00	15,910,400.00	6,288,000.00

Table 3. Feasibility analysis of seaweed farming for 1 year period

Analysis	NORTH MINAHASA	SOUTH EAST MINAHASA	MINAHASA	SOUTH MINAHASA
B/C	6,06	1,64	1,67	2,75
BEP (kg)	356,06	495.46	490,11	270,05
BEP (IDR)	4.984.829,51	6,936,451.14	6.861.489,49	3.780.742,89
PP (year)	0.10	0.14	0.09	0.08
NPV (IDR)	104.734.800,00	53,315,500.00	84.669.100,00	86.614.000,00
IRR (%)	45,81	30.13	31,85	33,82
ROI	52,37	39.72	35,00	40,00

CONCLUSION

Based on surveys, interviews and analysis, this study concluded that 1) the farming method practice in Minahasa peninsula is a long line method since it was considered suitable for the farming sites, easy, cheap and sustainably long up to 4 years so that it could save the investment cost; 2) despite being in the same waters, the planting system of *K. alvarezii* in Minahasa peninsula was different due to dissimilar nature condition; 3) the financial analyses of *K. alvarezii* farming in all regencies of Minahasa peninsula were feasible to develop and the best production was obtained in North Minahasa Regency. Knowing the site potential and the business feasibility in Minahasa peninsula, it could become a

discourse for the seaweed farmers, governments or private sectors to able to process the coastal natural resources optimally for the prosperity of the farmers and the coastal villagers.

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