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ECONOMIC FEASIBILITY ANALYSIS, VALUE ADDED AND MARKETING OF SEMI REFINED CARRAGEENAN (SRC) SEAWEED PROCESSING INDUSTRY

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Abstract

Dried seaweed produced by the community in three districts (Morowali, Parigi, and Bangkep) is the final product at the level of seaweed cultivators. They do not yet know about processing seaweed into SRC or gelatin. The research was conducted in Central Sulawesi Province by taking data on the 3 largest seaweed producing districts, namely Banggai Islands Regency, Morowali Regency and Parimo Regency. The main objective of this research is to formulate a strategic plan for the management of seaweed agribusiness through SRC agroindustry and to make it community-based in Central Sulawesi Province. The specific objectives include: Estimating land potential and seaweed production in Bangkep, Morowali, and Parimo Districts, Analyzing the land suitability of locations that are centers of seaweed cultivation in Bangkep, Morowali, and Parimo Districts, Analyzing the economic feasibility of SRC agro-industry and To be medium-scale, to develop a strategy for managing seaweed agribusiness through SRC agro-industry and agar in Central Sulawesi Province, and to empower communities through mentoring in SRC processing training and for the community, especially seaweed cultivators in Bangkep Regency, Morowali Regency and Parimo Regency. The need for primary data on water quality, potential and seaweed production is carried out by survey method by taking samples directly in the field by purposive sampling, namely sampling with certain considerations, sampling only at the cultivation location and simple random sampling, namely taking sample members. from the population randomly without regard to strata and is considered homogeneous in the population. The business feasibility analysis data, seaweed processing technology, and socio-economic data were carried out by direct interviews with structured questionnaires.

Keywords: *Pandemic, Work From Home, Productivity*

INTRODUCTION

Seaweed market opportunities are very promising (García-Poza et al., 2020), this condition is in line with the national plan which positions Indonesia as the largest seaweed producer in the world in 2010 replacing the Philippines with the advantages of the tropics (Bixler & Porse, 2011). The prediction of seaweed demand in 2010 will reach 390,100 tons (Eucheuma sp of 247,100 tons and 116,000 tons of other species including Gracillaria sp) is a rational calculation (Ferdouse, Holdt, Smith, Murúa, & Yang, 2018). The wide-open national market opportunity above shows that in 2008 Morowali Regency contributed 18.02% for Eucheuma cottoni species and Gracillaria sp species filled 2.60% market opportunities (Aryaningtyas & Risyanti, 2021).

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Central Sulawesi does have a fairly long coastline, which is more than 4,000 km (Henley, 2021). The length of this coastline has the potential for seaweed development (Potting, Thomas, & Gröndahl, 2021). Seaweed is one of the flagship programs in Central Sulawesi. The Ministry of Maritime Affairs and Fisheries has even made Central Sulawesi one of the areas that will become the center of seaweed in Indonesia (Yona, 2021).

This study aims to formulate a strategic plan for the management of seaweed agribusiness through SRC agroindustry and to be community-based in Central Sulawesi Province, to estimate the land potential and seaweed production in Bangkep, Morowali, and Kab. Parimo, analyzed the land suitability of locations that became centers of seaweed cultivation in Bangkep, Morowali and Kab. Parimo, analyzed the economic feasibility of SRC agro-industry and medium scale agar, developed a strategy for managing seaweed agribusiness through SRC agro-industry and agar in Central Sulawesi Province, carried out community empowerment through training assistance for SRC processing and the community, especially seaweed cultivators in Kab. Bangkep, Kab. Morowali and Kab. Parimo.

The prospect of seaweed development is by the government's program, namely 2011-2014 is a fairly important year in the development of aquaculture in Indonesia, because in that year the Ministry of Marine Affairs and Fisheries set a vision for the Development of Marine and Fisheries in Indonesia, namely "Realizing Indonesia as a Fishery Product Producer. and the World's Largest Marine in 2015" and the Fisheries and Marine Service of Central Sulawesi Province".

"Towards Central Sulawesi Seaweed Province 2011" and the grand strategy of launching "Echo Blue" (advanced movement of seaweed cultivation) and the grand strategy of Kab. Morowali until 2012 "Realizing Seaweed Agribusiness Based Regional Arrangement with Reliable Infrastructure". The benefits of research on institutional development are related to the existence of teaching staff in universities in developing a research culture. This has an impact on increasing knowledge and developing knowledge, theories and concepts for teaching staff which are then transferred to students both in the form of lecture materials and as a theoretical basis and literature for final research by students and other researchers. In addition, the existence of local and national institutions is related to optimizing the role of higher education institutions which are not merely producers of science and technology but can apply them in the form of business development policies (programs).

RESEARCH METHOD

The location of the research was carried out in the 3 largest seaweed producing areas, namely Bangkep Regency, Morowali Regency and Parimo Regency. Each district takes 2 sub-districts that produce the largest seaweed, both land and production potential. The need for primary data on water quality, potential and seaweed production was carried out using a survey method with direct sampling in the field by purposive sampling. Secondary data collection is obtained through research searches sourced from related agencies/agencies/institutions.

RESULTS AND DISCUSSION

Analyzing the Economic Feasibility of SRC and Agar Agroindustry

Dried seaweed produced by the community in three districts (Morowali, Parigi, and Bangkep) is the final product at the level of seaweed cultivators. They do not yet know about processing seaweed into SRC or gelatin, and in general, they do not even understand why seaweed is cultivated, except because there are buyers who are ready to accommodate all dried seaweed production. Processed seaweed that produces hydrocolloid compounds is the basic ingredient of more than hundreds of types of commercial products that are widely used in various industries.

Large Industry Producing SRC

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In principle, SRC processing can produce up to 49,641 kg/day, assuming this is a large-scale industry and an Agar of 2,288 kg/day is a medium-scale industry.

Medium Industry of Agar-Producing

In principle, the production process of agar can be divided into 2 methods, namely the freezing-thawing method and the pressing method. Based on the processing and production equipment, the production process of gelatin can be divided into 3 production methods, namely traditional, simple and modern methods.

Marketing Aspect

In 2013 the total export volume of seaweed reached 182 thousand tons. The export value increased by 17.8% compared to 2012. In 2014 the total export volume is estimated to increase by 20% compared to 2013. Of course, in 2015 the growth projection will not be much different. There are several advantages of the seaweed business including export market opportunities that are wide open, prices are relatively stable, and there is also no trade limit or quota for seaweed; simple cultivation technology, so easy to master; the cultivation cycle is relatively short so that it quickly provides benefits; relatively small capital requirements; is an irreplaceable commodity, because there is no synthetic product; Seaweed cultivation business is classified as a labor-intensive business, so it can absorb labor.

Technical And Production Aspect

Generally, business actors do not have their location or land for seaweed cultivation to be used as raw material for SRC and agar, especially for medium and large industrial scale businesses. Based on the analysis of SRC yield and agar content, the prediction of raw material requirements for each type of industrial business is adjusted to the planned annual production capacity. In this case, it is assumed that the production capacity of each type of business reaches 70% in the first year, 80% in the second year, and 90% in the third year, then 100% in the fourth and fifth years. These assumptions can be used as the basis for describing the need for raw materials as presented in Table 1.

Table 1.
Seaweed Raw Material Needs for SRC and Agar Production for Five Years

No	Production Years	Seaweed Raw Material Needs (kg)	
		SRC	Jelly
1	2019	52.123.400	1.680.000
2	2020	59.569.600	1.920.000
3	2021	67.015.800	2.160.000
4	2022	74.462.000	2.400.000
5	2023	74.462.000	2.400.000

Source: Primary data after processing, 2015.

Table 1 shows the amount of raw material needed for dried seaweed varies for the two types of products produced according to the planned production capacity, as well as the yield of each raw material used. This study or analysis chose to use 20% yield to produce SRC, so to produce 1 kg of SRC required 5 kg of dry seaweed (Eucheuma cottonii), therefore, the production of SRC in the first year was assumed to be 70% of the production capacity (14,892,400 kg/kg). yr) which is 10,424,680 kg, then 52,123,400 kg of dry seaweed is needed. The second year's production was 80%, namely 11,913,920 kg using Eucheuma cottonii of 59,569,600 kg, while for 90% production capacity, namely 13,403,160 kg using raw materials of 67,015,800 kg in the third year then the fourth and fifth years amounted to 14,892. 400 kg with raw material requirements of 74,462,000 kg.

Table 2.

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Requirements for Auxiliary Materials for Processing Seaweed on SRC and Jelly Products.

No	Years	SRC	Jelly	
		Potassium hydroxide (kg)	Sulfuric acid (L)	Acetic acid (L)
1	2019	5.212.340	50.400	50.400
2	2020	5.956.960	57.600	57.600
3	2021	6.701.580	64.800	64.800
4	2022	7.446.200	72.000	72.000
5	2023	7.446.200	72.000	72.000

Source: Primary data after processing, 2019.

Financial Aspect

The amount of funds needed to finance the investment plan for seaweed processing is highly dependent on the scale of the industry. In general, large-scale industries certainly require large funds. The calculation of financial needs is directed at achieving high efficiency from various alternative choices for capital expenditures and planned industrial operations. The total operational fund for the SRC industry is Rp. 1,570,882,437,133,-. The funds are used to finance operational activities for a year at a production capacity of 100% with a total SRC product of 14,892,400 kg or 1,241,033 kg/month.

Working Capital Needs for the Jelly Industry

The gelatin industry as a medium industry is considered to have a smaller working capital requirement than the SRC industry.

Table 3.
Operational Fund Needs for Medium-Scale Industrial Agar with Production Capacity per Year

No.	Description	Volume 1	Volume 2	Unit Price (Rp/Kg)	Value (Rp)
1	Dried Seaweed (kg/yr)	2.400.000	1	8.103	**19.448.100.000**
2	Auxiliaries Sulfuric Acid (liters/yr)	72.000	1	69.458	**5.000.940.000**
3	Acetic Acid Adjuvant (liter/yr)	72.000	1	81.034	**5.834.430.000**
4	Gas Refill 12 kg (times/unit)	12	2	170.171	**4.084.101**
5	Packaging Material (sheet/year)	48.048	1	5.788	**278.107.830**
6	Leadership Salary (person/month)	1	12	4.051.688	**48.620.250**
7	Production Manager Salary (org/month)	1	12	2.778.300	**33.339.600**

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8	Marketing Manager Salary (org/month)	1	12	2.778.300	**33.339.600**
9	Salary for Personnel (org/month)	1	12	2.778.300	**33.339.600**
10	Salary for Finance and Accounting (org/month)	1	12	2.778.300	**33.339.600**
11	Employee Salary (org/month)	20	12	2.025.844	**486.202.500**
12	Property Tax				**100.000**
13	Business Tax and Licensing				**3.000.000**
14	Equipment Depreciation				**18.792.083**
Total					**31.255.735.164**

Source: Primary data after processing, 2015.

SRC Industry Initial Investment

Calculation of the need for capital goods for the SRC industry is relatively large. For the purpose of investing in this type of business, it begins with the calculation of land acquisition for business locations, construction of factory buildings, warehouses and various types of factory equipment. The total initial investment of IDR 18,278,750,000 is assumed to be obtained from local government sources and bank loans with an interest rate of 16% per annum. The equipment for the SRC production process that cannot be held in Palu City will be imported from outside the region.

Initial Investment of the Agar Industry

Calculation of the initial investment or the need for capital goods for processing seaweed into gelatin with a medium industrial scale that requires a certain amount of capital is calculated from loans to banks. Various types of capital goods are needed for this medium-sized industry, starting from the procurement of business land, construction of factory buildings and warehouses as well as various types of factory equipment.

Working Capital Needs for the Jelly Industry

The gelatin industry as a medium industry is considered to have a smaller working capital requirement than the SRC industry. The operational funds needed for medium-sized jelly industries are calculated at Rp. 31,255,735,164 per year for a production capacity of 100% with a total product of 686,400 kg of agar or 57,200 kg/month.

The parties or business people will first assess before investing in a business, whether the funds that will be invested to run one of these types of businesses will generate greater cash in the next few years. Therefore, future cash flows are assessed at present (present value), thus the calculation of the feasibility of a business is based on several criteria, namely Payback Periods (PP), Gross Benefit Cost Ratio (Gross B/C), Net Present Value (NPV), Internal Rate of Return (IRR) and Profitability Index (PI).

The formulation of a seaweed agribusiness management strategy through SRC and Agardi agroindustry in Central Sulawesi Province is carried out through an analysis of regional resilience and modeling analysis that supports the sustainability of the agroindustry. Strengthening community capacity in supporting SRC and Agar agroindustry includes mastering skills in SRC and Agar manufacturing technology. Assistance in making SRC and Agar was carried out in three (3) districts namely Silampayang Parigi Mautong Village, Bungintimbe Village, Mohino Morowali Village and Apal Village and Gansal Banggai Islands Village. The public's interest in participating in this empowerment activity is very high

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considering that the area is still lacking in increasing knowledge of seaweed management, cultivation and processing.

Table 4.
Results of Analysis of Investment Criteria in Each Type of Seaweed Processing Industry with SRC and Agar Products

No	Kriteria Investasi	Type of business	
		SRC	Jelly
1.	*Payback period (Thn)*	3 years 6 month	**3 years 4 month**
2.	*Gross Benefit Cost Ratio*	1,17	**1,19**
3.	*Net Present Value* (Rp)	492.471.237.310	**9.964.317.121**
4.	*Internal Rate Of Return* (%)	98,90	**81,80**
5.	***Profitability Indeks***	**27,94**	**10,63**

Source: Primary data after processing, 2020.

The results of the analysis using the five investment criteria show that all types of seaweed processing businesses (SRC and Jelly) show numbers that meet the eligibility requirements of the calculation formulation. For the period of return on investment, the SRC and jelly industries occupy almost the same time, this condition is closely related to the production and selling price of each product. The NPV shows a positive number, while the IRR is above the prevailing bank interest rate, even the IRR for SRC businesses reaches 98.90% and the highest PI achievement is also obtained by the SRC industry, which is 27.94.

Analyzing Seaweed Marketing with Marketing Margin Analysis and Value Added Analysis

Marketing Margin Analysis

Marketing Margin (trading) is the difference between the price paid by consumers and the price received by producers. This margin will be accepted by the commercial institutions involved in the marketing process, the longer the trading system (the more commercial institutions involved), the greater the marketing margin (Daniel, 2002: 159). Profit is the difference between the price paid to the first seller and the price paid by the last buyer (margin) after deducting marketing costs (Soekartawi, 2002:71). The analysis of marketing and share received by farmers with the following formula:

$$M = Pr - Pf$$

Meanwhile, to find the farmer's share is:

$$Sp = Pf / Pr \times 100\%$$

Information :
M : Marketing Margin
Sp: Farmer's Share
Pr : Prices at the consumer level
Pf : Price at Producer level

The calculation of marketing margin analysis and share analysis of SRC and Jelly processing industry producers is as follows:

Margin Analysis of E. cottoni Seaweed Marketing and SRC Processing Industry

The marketing margin calculation is divided into two channels, namely the marketing channel of *E. cottoni* seaweed with the following marketing channels:

Table 5. Marketing Channels of *E. cottoni* Seaweed

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No	Description	Selling Price (Kg)	Purchase Price (Kg)
1	Farmer	7.500	
2	Collector merchant	9.500	7.500
3	Consumers (Processing Industry in Palu City)		9.500

Source: Primary data after processing, 2020.

M = Pr – Pf
M = 9.500 - 7.500
= 2.000

So the marketing margin obtained by E. Cottoni seaweed farmers is Rp. 2,000/kg

Sp = Pf / Pr x 100%
Sp = 78,95%

So the price received by seaweed farmers E. Cottoni 60% paid by the final consumer, the seaweed business can be said to be efficient with the acquisition of seaweed farmers' share of 78.95%. Meanwhile, the calculation of the marketing margin for the SRC processing industry is as follows:

Table 6.
SRC Processing Industry Marketing Channels

No	Description	Seliing Price (Kg)	Purchase Price (Kg)
1	Producer (Processing Industry in Palu City)	80.000	56.050
2	Consumer (Buyer in Surabaya)		80.000

Note: to produce 1 kg of SRC it takes 5 kg of RLK
producer selling price = (5kg RLK x Rp 9,500) + cost of auxiliary materials
Source: Primary data after processing, 2020.

M = Pr – Pf
M = 80.000 - 56.050
= 23.950

So the marketing margin obtained by SRC producers is Rp. 23,950/kg

Sp = Pf / Pr x 100%
Sp = 70,06%

So the price received by SEC producers 60% paid by final consumers, the seaweed business can be said to be efficient with the acquisition of seaweed farmers' share of 70.06%.

Marketing Margin Analysis of Gracilaria sp. and Jelly Processing Industry

Calculation of marketing margin for Gracilaria sp. with the following marketing channels:

Table 7.
Marketing Channels of Gracilaria sp . Seaweed

No	Description	Seliing Price (Kg)	Purchase Price (Kg)
1	Farmer	5.500	
2	Collector merchant	7.000	5.500
3	Consumers (Processing Industry in Palu City)		7.000

Source: Primary data after processing, 2020.

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M = Pr – Pf
M = 7,000 - 5,500
= 1,500
So the marketing margin obtained by Gracilaria, sp seaweed farmers is Rp. 1,500/kg
Sp = Pf/Pr x 100%
Sp = 78.57%

So the price received by Gracilaria seaweed farmers, sp 60% paid by the final consumer, the seaweed business can be said to be efficient with the acquisition of seaweed farmers' share of 78.57%. Meanwhile, the calculation of the marketing margin for the jelly processing industry is as follows:

Table 8.
Marketing Channels for the Jelly Processing Industry

No	Description	Selling Price (Kg)	Purchase Price (Kg)
1	Producer (Processing Industry in Palu City)	35.000	28.100
2	Consumer (Buyer in Surabaya)		35.000

Note: to produce 1 kg of Agar, it takes 3.5 kg of RLK
producer selling price = (3.5kg RLK x IDR 7,000) + cost of auxiliary materials
Source: Primary data after processing, 2020.

M = Pr – Pf
M = 35,000 - 28,100
= 6900

So the marketing margin obtained by SRC producers is Rp. 6,900/kg

Sp = Pf/Pr x 100%
Sp = 80.29%

So the price received by the producer of Jelly 60% paid by the final consumer, the seaweed business can be said to be efficient with the acquisition of seaweed farmers' share of 80.29%

Value-Added Analysis

Analysis of the added value obtained from the value of the final product minus the intermediate costs. The intermediate costs consist of the cost of raw materials and the cost of auxiliary materials in the production process. In general, the concept of added value used is gross added value, where the intermediate cost components that are taken into account include the cost of raw materials, as well as transportation costs (Tarigan, 2004). The analysis used is formulated as follows:

Gross Value Added
NTb = Na – Ba
= Na – (Bb + Bp)

Information:
NTb = Gross Value Added (Rp)
Na = Value of the final product Seaweed (Rp)
Ba = Intermediate cost (Rp)
Bb = Seaweed raw material cost (Rp)
Bp = Cost of auxiliary materials (Rp)

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Net Value Added (NTn)

NTn = NTb – NP

$$NP = \frac{\text{initial value - residual value}}{\text{Economic age}}$$

Information:
NTn = Net value added (Rp)
NTb = Gross added value (Rp)
NP = Depreciation Value (Rp)

Value Added per Raw Material

NTbb = NTb : bb

Information:
NTbb = Value added per raw material used (Rp/Kg)
NTb = Gross added value (Rp)
∑bb = Amount of raw materials used (kg)

SRC Industry Added Value

The analysis of the added value of the SRC processing industry consists of gross added value, net added value, and added value per raw material. More details can be seen in the following table:

Table 9.
Analysis of the added value of the SRC processing industry for 5 years

No	SRC Processing Industry	Value (Rp)				
		Year 1	Year 2	Year 3	Year 4	Year 5
1	Final product value (Rp)	833.974.400.000	1.143.736.320.000	1.544.044.032.000	2.058.725.376.000	2.470.470.451.200
2	Raw material value (Rp)	495.172.300.000	594.206.760.000	701.906.735.250	818.891.191.125	859.835.750.681
3	Amount of raw material (kg)	52.123.400	59.569.600	67.015.800	74.462.000	74.462.000
4	Cost of auxiliary materials (Rp)	445.655.070.000	534.786.084.000	631.716.061.725	737.002.072.013	773.852.175.613
5	Depreciation cost (Rp)	597.520.833	597.520.833	597.520.833	597.520.833	597.520.833
6	Intermediate fee (Rp)	445.655.070.000	534.786.084.000	631.716.061.725	737.002.072.013	773.852.175.613
7	Gross value added (Rp) (1 – (2+4))	388.319.330.000	608.950.236.000	912.327.970.275	1.321.723.303.988	1.696.618.275.587
8	Net value added (Rp) (7-5)	387.721.809.167	608.352.715.167	911.730.449.442	1.321.723.303.988	1.696.615.275.587
9	Value added per raw	7.450	10.223	13.614	17.750	22.785

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material (Rp/kg) (7/3)	

Source: Primary data after processing, 2020.

Gross value added is the basis for calculating net value added and value added per raw material. Analysis of the added value of the SRC processing industry and the Jelly processing industry with the final product received is the value given or sold from the company to consumers. The amount of intermediate costs incurred is obtained from the sum of the costs of raw materials and the costs of auxiliary materials, the greater the intermediate costs, the smaller the gross added value created. The greater the added value, the greater the income obtained and vice versa. The added value per raw material aims to determine the productivity of the raw materials used to produce SRC and Jelly products.

CONCLUSION

Based on the results and discussion, the things that can be concluded in this study are: the feasibility of investing in the SRC processing industry requires a payback period of 2 years 6 months, processing for 3 years 4 months with an SRC NPV of Rp. 492,471,237,310 and for Rp. 9,964,317,121, IRR SRC is 98.90% and agar is 81.80% and Gross BCR SRC is 1.17 and agar is 1.19. The value added analysis with the final product received for the SRC processing industry is greater than that for the agar processing industry. The strategic plan for the management of seaweed agribusiness through the SRC agro-industry and agar based on the analysis of regional resilience that supports the SRC and agar agro-industry is Morowali Regency, Banggai Islands and followed by Parigi Mautong Regency. Workforce that supports the agroindustry in a sustainable manner.

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