TABLE VII
INVESTMENT OPPORTUNITY FOR MIDDLE-SCALE SEMI REFINE CARRAGEENAN (SRC) MODEL AND CARRAGEENAN INDUSTRY MODEL IN SALABANGKA ARCHIPELAGOES

Investment criteria	Business model	
	SRC	Carrageenan industry
Payback periods (PBP)	2 year, 9 month	3 year, 5 month
Net Benefit Cost Ratio (NetB/C ratio)	1.35	1.88
Net Present Value (NPV)	IDR. 1,786,785,601	IDR. 2,690,243,917
Internal Rate of Return (IRR)	35%	33.93%
Profitability Index (PI)	2.94	2.95

B. *Environmental Conditions and Suitability for Seaweed Cultivation*

The environmental conditions support seaweed cultivation in Harvest Season (June – July) (Table 8). For instance, the strong water current of (0.11 – 0.17 m/s) (Table 8) could hold a better condition for seaweed cultivation [23] by providing a barrier and nutrition that is essential for seaweed development. The degree of water clarity reveals that the light, which is essential for seaweed photosynthesis, can penetrate through the water (around 2.00 – 4.6 m) (Table 8). The suitable temperature for *Eucheuma cottoni* ranges from 26 – 33°C [24], which is also reflected in both seasons (Table 8). The suitable range of total suspended solid for *Eucheuma cottoni* cultivation is around <25 ppm [25]. Based on this parameter, both seasons show a proper condition for *Eucheuma cottoni* cultivation (Table 8) since the higher level of TSS could prevent the natural light from penetrating the seafloor. A high degree of differences in the total dissolved solid parameter was also observed (Table 8). However, it is still considered suitable, below the lowest threshold < 80 ppm [23]. The suitable depth for seaweed cultivation must be less than 10 meters above the sea ground [23], and both seasons show a roughly suitable condition (Table 8). For the acidity, as previously stated by Poncomulyo et al. [23], the optimum acidity (pH) for seaweed cultivation is around 7.3–8.2, and both seasons fall under this range (Table 8). The dissolved oxygen, essential for aquatic organism respiration, also shows a good range in both seasons (Table 8). If the span falls below 4 ppm, it indicates extreme perturbances to the aquatic ecosystem [26]. The nitrite content originating from industrial, or community waste shows an unsuitable condition during harvest season due to the high nitrate content (16.97 ppm) (Table 8). Akhter et al. [27] stated that the average amount of nitrite in seawater must fall between 0.5 – 3 ppm. The high nitrate content might be due to the east season, which carries organic material from the human settlement after the heavy rain and later accumulated nitrite on the sea. As an essential nutrient for an aquatic organism, the phosphate parameter shows a suitable condition (Table 8). Widianingsih et al. [28] stated that the phosphate content must fall between 0.02 – 1 ppm. Summarizing all of these limiting factors, it can be concluded that the harvest season time yields a suitable condition for seaweed *Eucheuma* cultivation in the Salabangka archipelagos (Table 8).

TABLE VII
ENVIRONMENTAL CONDITIONS BASED ON LIMITING FACTORS AND SUITABILITY OF SEAWEED CULTIVATION IN SALABANGKA ARCHIPELAGOES

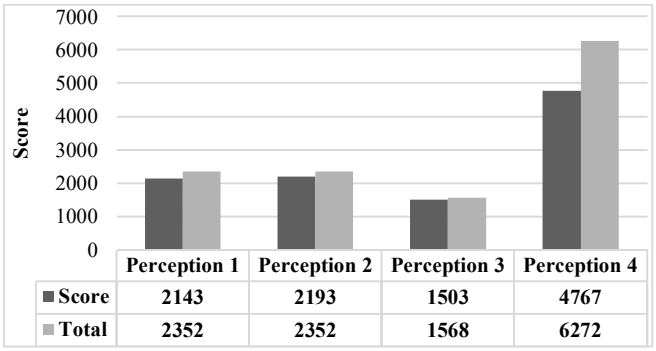
No.	Limiting factors	Famine season (April–May)	Harvest season (June–July)
		Range	
1	Water current (m/s)	0.05 – 0.02	0.11 – 0.17
2	Water clarity (m)	1.7 – 4.4	2.00 – 4.6
3	Water temperature (°C)	29.0 – 32.0	28.3 – 30.0
4	Total suspended solid (ppm)	1.26 – 14.31	1.16 – 7.35
5	Total Dissolved solid (ppm)	27.26 – 54.08	50.27 – 51.16
6	Sea depth (m)	0.01 – 0 .05	1.05 – 18.6
7	Acidity (pH)	7.9 – 8.7	7.7 – 8
8	Dissolved oxygen (ppm)	6.8 – 9.84	7.1 – 9.83
9	Nitrite (ppm)	0.88 – 2.2	0.48 – 16.97
10	Phosphate (ppm)	0.07 – 0.30	0.03 – 0.35
	Physic-Chemical categorization	**Suitable**	**Not Suitable**

The environment was one of the crucial factors in seaweed cultivation's success and increased human well-being. Seaweed farming could contribute a positive impact on the environment. A previous study found that the construction of seaweed farms correlated to increased seagrass habitat [29]. Another study also found that the rate of mangrove loss is reduced along with the initiation of aquaculture farms [30]. Several studies have found a positive correlation between seaweed farming to the population of ratfish [31] and the reduction of some fishing [32]. Knowing the good indication of these limiting factors aforementioned and effective implementation of such aquaculture could facilitate increased environmental and well-being quality.

C. *Local Participation of Coastal Communities*

Based on the local perception (Fig. 5), Perception 1, defined as local support for the seaweed cultivation area, reached 2,143 positive reinforcements out of 2,352 respondents (91.11%). Perception 2, defined as local support on seaweed management, reached 2,193 positive supports out of 2,352 respondents (93.23%) (Fig. 5). Perception 3, defined as local support on community capabilities, reached 1,503 positive supports out of 1,568 respondents (95.85%). Perception 4 represents local support as participation, come 4,767 positive reinforcements out of 6,272 respondents (76%) (Fig. 5). Overall, the perception and participation of coastal communities show that they support the empowerment effort through Seaweed cultivation.

The local participation concept is highly associated with transparency, to say that the coastal communities would participate if the government accounted for integrity and transparency. By this concept, the people also have the right to the decision along with the government. The institutional arrangement [33], local decision-making rights and capacity [34], and social sustainability [35] are necessary to accomplish these goals in the future.



	Perception 1	Perception 2	Perception 3	Perception 4
Score	2143	2193	1503	4767
Total	2352	2352	1568	6272

Fig. 5 Scoring of local participation toward Seaweed production empowerment in Salabangka archipelagoes. Perception 1 = cultivation area, Perception 2 = seaweed management, Perception 3 = community capabilities, Perception 4 = community participation.

IV. CONCLUSION

Coastal community's empowerment in Salabangka archipelagoes through Seaweed (*Eucheuma cottoni*) cultivation promises good opportunities. From the perspective of its potency, it shows an increase in Productivity in the year afterwards and a profitable prospect for future investment. The environmental condition also indicates a good qualification for seaweed cultivation. The local participation shows that they support the empowerment effort through the Seaweed Eucheuma cultivation. However, the government must secure the policy, allocate funding, and forge a partnership with the local bank to bolster the seaweed cultivation in Salabangka archipelagoes.

ACKNOWLEDGMENT

The authors thank Tadulako University for facilitating this research.

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