PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN

Daniel Bunga Paillin
Industrial Engineering Department, Pattimura University, Jl. Ir. M. Putuhena-Kampus Poka, Ambon, 97233, Indonesia, dani.ti.fatek@gmail.com (corresponding author)

Johan Marcus Tupan
Industrial Engineering Department, Pattimura University, Jl. Ir. M. Putuhena-Kampus Poka, Ambon, 97233, Indonesia, johan.tupan@fatek.unpatti.ac.id

Jacobus Bunga Paillin
Faculty of Fisheries and Marine Sciences, Pattimura University, Jl. Mr. Chr. Soplanit-Kampus Poka, Ambon, 97234, Indonesia, bobby_bunga@ymail.com

Victor Oryon Lawalata
Industrial Engineering Department, Pattimura University, Jl. Ir. M. Putuhena-Kampus Poka, Ambon, 97233, Indonesia, lawalata.victor@gmail.com

Wilma Latuny
Industrial Engineering Department, Pattimura University, Jl. Ir. M. Putuhena-Kampus Poka, Ambon, 97233, Indonesia, wlatuny@gmail.com

Keywords: distribution chain, AHP, Liberatore, seaweed, middlemen (tengkulak).
Abstract: Seram Bagian Barat (SBB) Regency is a good location for seaweed cultivation in Maluku Province. The area of land and the amount of seaweed production in the area is vast. However, in one of the giant seaweed-producing areas, the lives of most seaweed farming communities are still below the poverty line and are not prosperous due to the long distribution chain and the dominance of middlemen's role in their business still huge. This study aims to analyse and obtain the best-prioritized strategy to overcome the dominance of middlemen (called tengkulak) in seaweed cultivation using the Analytical Hierarchy Process (AHP) method with the Liberatore approach. From the results of data processing, it was obtained that the best strategy that became a priority for the prevention of domination in seaweed cultivation was the strategy Utilizing marketplaces or digital marketing with the highest weight of 0.483, followed by the strategy Expanding the Role of Regional Companies in Marketing at the Provincial and District with a weight of 0.241, the strategy Activating Cooperatives on a District Scale with a weight of 0.224. The last one is the strategy The Department of Industry and Trade Regulates the Overall Chain of Commerce" with a weight of 0.036. These results can be used as the basis for policymaking for the Seram Bagian Barat Regency government in shortening the seaweed distribution chain as one of the superior regional commodities so that it can improve the performance of the seaweed supply chain in the future.

1   Introduction

The Central Statistics Agency for Maluku Province shows that the total seaweed production in Maluku Province in 2020 is 71,928.65 tons with a production value of Rp. 224,634,529,000 [1]. Although Maluku Province is one of the largest seaweed-producing areas in Indonesia, the lives of most of the coastal communities are below the poverty line and are still not prosperous. Based on previous research [2-4] explains that the marketing chain for seaweed cultivation consists of nodes of local traders or middlemen, middle or inter-island traders, and exporters, which are almost the same model for the type of seaweed in Indonesia, which is shown in Figure 1.

The seaweed marketing chain's length causes the product's purchase price at the farmer level to be very low, where the price per kilogram is Rp. 8,000 to Rp. 10,000. Meanwhile, the selling price to advanced consumers is Rp. 24,000 up to Rp. 32,000 higher than the price at the farm level, so there is a significant price disparity of 65%-

68.75% (source: data processed from various sources). This is also supported by the research of [5] regarding the value chain of seaweed distribution on the island of Tarakan, which shows a significant price disparity between farmers and exporters. The low price of seaweed makes cultivators feel disappointed because the price offered is not commensurate with the hard work they have done so far. Even some farmers hold their seaweed products for sale for the same reason, namely the price is too low [6]. Seaweed cultivation is a mainstay business for coastal communities in Seram Bagian Barat (SBB) Regency, so it has a very immediate impact on improving welfare and increasing the rate of community economic growth.

From the description above, analysing the selection of middlemen prevention strategies is necessary to shorten the seaweed distribution chain in Seram Bagian Barat Regency. Therefore, this study aims to find the best strategy, which is a priority for preventing the dominance of middlemen in seaweed cultivation in the Seram Bagian

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

Barat (SBB) Regency. The results of this study are expected to be applied in policy-making to protect seaweed farmers against middlemen, improve the welfare of seaweed farmers and empower coastal communities, and can be used to alleviate poverty in Indonesia.
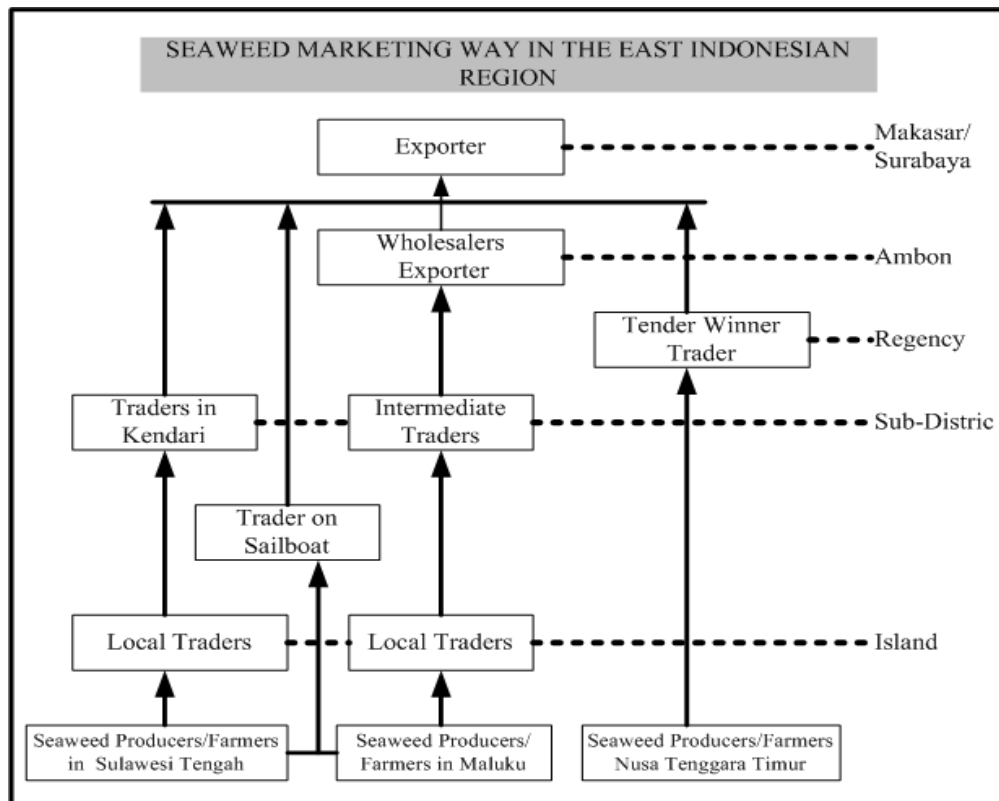

Figure 1 Seaweed Distribution Chain Path in Eastern Indonesia

2   Literature review

The development of seaweed cultivation is an alternative to empowering coastal communities, which has advantages in terms of a) the products produced have various uses; b) efficiency in land use with a high level of productivity; c) business units can be determined according to capital capacity by using simple technology; and d) easy to monitor because the cultivation container is relatively limited and protected from predators and easy to harvest [7]. Seaweed cultivation has a vital role in efforts to increase fishery production to meet food and nutritional needs and meet domestic and foreign market needs, expand job opportunities, increase the income and welfare of cultivators and maintain the preservation of aquatic biological resources. Seaweed has bright prospects as a trading commodity that has the opportunity to be developed in Indonesian waters [8].

Maluku Province is one of the largest seaweed producers in Indonesia. The distribution area for seaweed cultivation in Maluku province is spread over six regencies: Seram Bagian Barat (SBB) Regency, Maluku Tengah Regency, Maluku Tenggara Regency, Maluku Barat Daya (MBD) Regency, Seram Bagian Timur (SBT) Regency, and the Kepulauan Aru Regency. Seaweed production in 2020 in Maluku Province is 71,928.65 tons with a production value of Rp. 224,634,529,000, - and the

planting frequency is six times a year [1]. This result is still far from what is expected, considering the enormous potential of the seaweed cultivation business. Based on regional characteristics and availability of resources, the centers for developing seaweed cultivation areas in Maluku Province are: 1. Seram Bagian Barat (SBB): West Seram; 2. Kepuluan Aru: Wamar Island; 3. Maluku Tenggara: Kei Kecil; 4. Maluku Tengah: Tuhaha Bay (Saparua Island) and Nusalaut Island; 5. Maluku Barat Daya (MBD): Saumlaki.

Although seaweed cultivation is relatively easy, the process still requires operational costs. Most farmers depend on business capital per family, so the number of units of seaweed cultivated is also different; limited capital is a common obstacle felt by seaweed farmers [9]. This fee is generally used to buy ropes, buoys, seedling ropes, wooden stakes, labor costs for seedling, buying seeds, diesel fuel costs, transportation costs for rent (for those who do not have a canoe or boat, especially if the cultivation area is a bit far from where they live). To reduce costs, some cultivators have finally asked for assistance in providing seeds to middlemen or collectors, which will later be deducted during harvest transactions. Due to the high cost of production, the subsequent impact is that the exchange rate in the agricultural and plantation sectors is

Acta logistica   - International Scientific Journal about Logistics
Volume: 9 2022 Issue: 3 Pages: 279-290 ISSN 1339-5629

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

low, especially when compared to the development of prices for other basic needs of the community [10].

Wholesalers control the price of seaweed, in this case, the markets in Makassar and Surabaya. Meanwhile, in terms of selling their harvests (both wet and dry), many farmers complain because they do not have a strong bargaining position, especially in determining the selling price of seaweed. The interaction between farmers and cultivators with markets on the mainland is still weak, so until now, market access has only been collected by the same people. Based on these conditions, middlemen tend to manipulate prices according to their wishes and carry out monopolies. One of the reasons for the decline in seaweed sales is the price distortion at the collector level, where the price is determined by the buyer or middlemen [6,11].

In general, the bargaining positions of farmers with middlemen or debt bondage are relatively low, so even though they are primary producers, in the structure of the fishery commodity trading chain, their position is generally weak [10]. Due to their lack of access to markets and the constraints of existing transportation infrastructure, local farmers are often powerless when they bargain about the selling price of the commodities they produce.

Production until now is still in the form of raw materials, where farmers directly sell their harvests in wet form or sell dry crops. Because it is only raw materials, the price of this commodity is controlled by buyers in the Makassar or Surabaya markets. The condition of the low price set by buyers in Surabaya will increasingly "suffocate" farmers because collectors or middlemen will also manipulate the price. This is what causes seaweed farmers to stop cultivating, even en masse. This is in line with [6] findings that the saturation of the selling price of seaweed causes not all people to want to become seaweed farmers.

Several factors have caused the agricultural sector in the archipelago to have not been able to develop optimally, in addition to the unavailability of production facilities in the local market, also because local farming communities generally do not understand properly how to cultivate correctly, the seeds and superior varieties offered are not by the preferences of the farming families [12]. In general, seaweed farmers in Indonesia experience a lack of knowledge, causing a lack of innovation in managing crop yields by market demand [13]. Meanwhile, the processing process has not been supported by adequate technology and facilities because the existing industry is home.

The decline in seaweed sales was due to erratic seasonal/weather factors, water pollution, disease-infected seaweed, and the presence of seaweed predators [6,14]. This also occurs in seaweed cultivation in Seram Bagian Barat (SBB) Regency, where the cultivation conditions have begun to decline. Cultivated seaweed suffers from "fall off" disease. According to farmers, this disease causes crop yields to decrease by up to 50%, and in some cases, there are total crop failures.

Many previous studies on seaweed, one of them by [15], analysed the feasibility of seaweed cultivation in the Seram Bagian Barat (SBB) regency. The value obtained by IRR is 97.5%, higher than the commercial bank interest rate prevailing at the time of the study, which is 18%. The IRR is greater than the commercial bank interest, indicating that the seaweed cultivation business can develop. This is also supported by several similar studies conducted in southern Konawe and Pulau Laut Kotabaru, Indonesia [16,17]. [3] Tries to see the contribution of technology components (technoware, humanware, infoware and orgaware) to increase seaweed productivity in the Seram Bagian Barat (SBB) Regency. This study indicates that the technoware component provides the highest contribution to the productivity of seaweed cultivation. [18] Conducted risk identification, risk assessment, and risk mitigation of the seaweed supply chain in Indonesia using Multi-Criteria Decision Analysis (MCDA) by proposing alternative risk prevention/mitigation strategies, the Fuzzy Failure Mode and Effect Analysis method. (Fuzzy -FMEA) is also used to identify supply chain risks for seaweed cultivation in Sabah Malaysia [19]. In addition, [20] mapping a strategy for developing seaweed cultivation using SWOT analysis, shows that the priority for the weakness factor is the absence of financial institutions as providers of capital and the existence of a trade monopoly from middlemen, as well as fluctuating prices.

This study looks at one of the gaps or problems in the marketing and distribution of seaweed dominated by middlemen/broker/collector (called tengkulak) and is approached with a Multi-Criteria Decision Making (MCDM) method, namely the Analytical Hierarchy Process (AHP). However, this research has an element of novelty in producing priority strategies for post-harvest seaweed to shorten the seaweed distribution chain, which will impact the performance of the seaweed supply chain in the future.

3   Methodology

Research methodology, in principle, is a method or technique that is arranged regularly and systematically for problem-solving in achieving the desired goal [21]. This study discusses the selection of the best strategy that becomes a priority for preventing the dominance of middlemen in seaweed cultivation in the Seram Bagian Barat (SBB) Regency, which is approached by a Multi-Criteria Decision Making (MCDM) method, namely the Analytical Hierarchy Process (AHP). The following are several stages in this research referring to the steps and basic principles of AHP:

1. The first stage is to determine the objectives, criteria, sub-criteria, and strategies through literature studies, brainstorming, and interviews with experts such as the Industry and Trade Office, Field instructor of Marine and Fishery Office, Processing and Marketing Division of the Maluku Province Marine and Fisheries Office, academics, farmers or seaweed cultivators which will then be used in the preparation of the assessment questionnaire.

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

2. The next stage is decomposition, namely constructing the problem into a hierarchical structure, namely level 1: Goals; level 2: criteria; level 3: sub-criteria; level 4: rating scale; level 5: strategies, as shown in Figure 2 below:
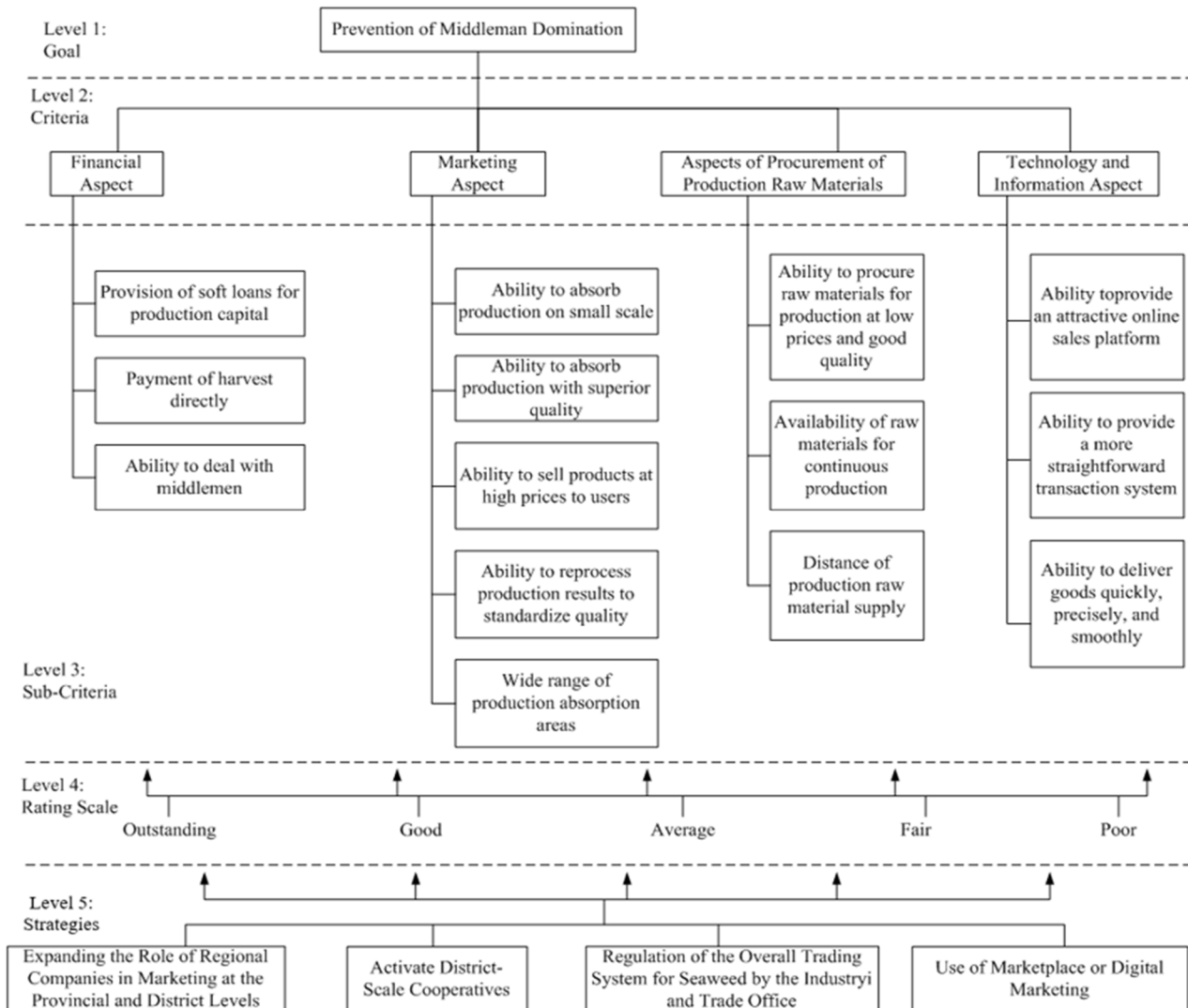

Figure 2 The hierarchical structure of strategy selection of middlemen prevention

3. After the hierarchical structure and questionnaire were developed, the next stage was the assessment of pairwise comparisons between criteria and sub-criteria by respondents, which was then transformed into a paired comparison matrix for numerical analysis. The numerical value for all comparisons is obtained from a comparison scale from 1 - 9, which Saaty has set, as in table 1 below [22]. The results of the questionnaire recap by each respondent were collected, combined, and processed using the geometric mean approach at each criterion and sub-criteria level to obtain the corresponding consensus pairwise comparison judgment matrices [23-24].

Table 1 Pairwise comparison rating scale

Scale	Pairwise	Definition
1	1	Equal Importance
3	$1/3$	Moderately more important
5	$1/5$	Strongly more important
7	$1/7$	Very strongly more important
9	$1/9$	Extremely more important
2,4,6,8	$1/2, 1/4, 1/6, 1/8,$	Intermediate

Acta logistica - International Scientific Journal about Logistics
Volume: 9 2022 Issue: 3 Pages: 279-290 ISSN 1339-5629

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

4. Consistency test. In determining the weight of each criterion, it is necessary to test the consistency of preferences to find out whether there is a random element. Inconsistency may occur because humans have limitations in expressing their perceptions consistently, especially when comparing many criteria [25], [26]. The consistency index (CI) is calculated using Equation 1, where max is the largest unique eigenvalue n and is the size of the matrix.

$$CI = \frac{\lambda_{max} - n}{n - 1} \qquad (1)$$

The inconsistency limit that Saaty has set is determined using the Consistency Ratio (CR) equation, which is the comparison of the Consistency Index (CI) with the Random Index (RI) value shown in equation 2. The assessment is said to be consistent if the CR value < 0.1

$$CR = \frac{CI}{RI} \qquad (2)$$

5. Determination of weighting criteria and ranking with five Liberatore Scales. Based on the pairwise comparison calculations obtained in the previous stage, the weights for the criteria and sub-criteria were calculated. After obtaining the weights of each criterion, then each criterion is entered into five Liberatore scales, which consist of Outstanding (O), Good (G), Average (A), Fair (F), and Poor (P), adjusted for assessment between strategies [27-29]. Table 2 below is the Pairwise comparison judgment matrix (PCJM) for the five-point rating scale.

Table 2 Pairwise comparison judgment matrix (PCJM) for five-point rating scale

	O	G	A	F	P
O	1	3	5	7	9
G	1/3	1	3	5	7
A	1/5	1/3	1	3	5
F	1/7	1/5	1/3	1	3
P	1/9	1/7	1/5	1/3	1

This matrix is then translated into the largest eigenvalue problem and the resulting priority weights of Outstanding = 0.513, Good = 0.261, Average = 0.129, Fair = 0.063 and Poor = 0.034 [29].

4 Result and discussion

4.1 Determination of strategy prevention for Middlemen

The problem of middlemen is no longer a new scourge among cultivators of agricultural products. So, choosing how to deal with middlemen is not an easy thing. Many efforts have been made by government, private and non-governmental organizations (NGOs) to tackle the problem of middlemen, but it is still tough to find success stories from these efforts. Because the success of seaweed cultivation involves quite a lot of cultivators' independence from middlemen, selecting methods to prevent these middlemen is very important.

The method used to select strategy methods for dealing with middlemen is AHP. This method is used because AHP can make the problem of selecting a middlemen prevention method more structured and able to cover various influential criteria. AHP also accommodates different weighting for each criterion and considers the level of consistency in the weighting.

In order to prevent the domination of the middlemen, it is necessary to formulate a strategy that can be applied to reduce the factors causing the strong dominance of the middlemen in the life of seaweed farmers. The strategy used in preventing the domination of middlemen is formulated from the results of a literature study and interviews with experts in the field of seaweed marketing. The strategies proposed are strategies that are considered to contribute to preventing the problem of middlemen domination.

The strategies are as follows:

1. Expanding the Role of Regional Companies in Marketing at the Provincial and District Levels. Regional-Owned Enterprises (BUMD) are business entities whose capital is partially/wholly owned by the regional government to provide services to the local community. The purpose of the BUMD itself is to serve the community's needs in the area and obtain profits that will be used for development in the area. So far, the business entities that we often encounter are the Regional Drinking Water Company (PDAM). PDAM itself also always assists communities in remote areas through capital assistance. Likewise with banking companies such as the Maluku Regional Development Bank or BPDM. The role of banking for the community is not only in cities but also in remote areas. This is through capital assistance for people who want to build a business. The role of regional companies to assist the community in developing businesses engaged in fishery products is still very minimal.

   For this reason, it is necessary to expand the role of regional companies in encouraging and assisting the community in developing their businesses. For example, the seaweed cultivation business is a trend in the industrial sector. This is to overcome the problems in farmers related to seaweed marketing. So that later it is hoped that the role of regional companies can reduce

Acta logistica - International Scientific Journal about Logistics
Volume: 9 2022 Issue: 3 Pages: 279-290 ISSN 1339-5629

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

the role of middlemen in marketing seaweed so that the seaweed marketing chain becomes short and the lives of seaweed farming communities become prosperous [2,30]. For this reason, the expansion of the role of regional companies is significant for the government to follow up.

2. Activate District-Scale Cooperatives. A fishery cooperative specializing in handling seaweed was developed as an effective forum for fighting for the interests of seaweed farmers. Through this cooperative, it is hoped that countervailing power will be created against various business climates that have been detrimental to seaweed farmers. In addition, cooperatives are also expected to develop more profitable input and output markets, improve production and marketing efficiency, better risk management, ensure business continuity, and increase the income of seaweed farmers [31].
The model for developing cooperation in the development of seaweed farmers involving cooperatives is as follows:

a. Partnership Cooperation Pattern. Partnerships between farmers/farmer groups/cooperatives and partner companies can be made according to two patterns, namely:

- Farmers who are farmer groups enter into direct cooperation agreements with Marine and Fisheries/Exporter Processing Companies.
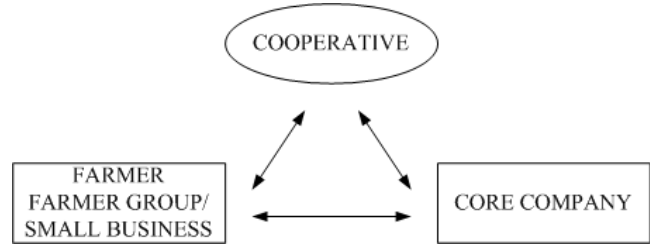The scheme of this partnership pattern can be seen in Figure 3 below:

Figure 3 Partnership Pattern 1

With this form of cooperation, lending to plasma farmers is carried out with the cooperative position as Channeling Agent, and farmer groups directly handle its management. While the Partner Company must provide the problem of coaching.

- Farmers who are members of farmer groups, through their cooperatives, agree with the cooperative (representing its members) and marine and fishery/processing/exporter companies.
The scheme of this partnership pattern can be seen in Figure 4 below:

Figure 4 Partnership Pattern 2

In this form of cooperation, lending to plasma farmers is carried out with the cooperative position as Executing Agent. The problem of technical development of plant cultivation/business management, if the Partner Company cannot implement it, will be the responsibility of the cooperative. The mechanism of the Integrated Partnership Project can be seen in Figure 5 below:
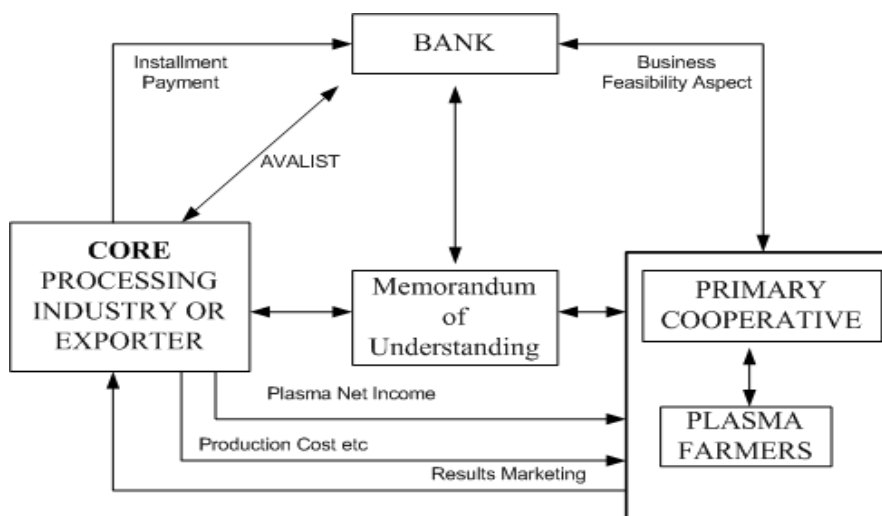

Figure 5 Integrated Partnership Project Mechanism

Acta logistica   – International Scientific Journal about Logistics
Volume: 9 2022 Issue: 3 Pages: 279-290 ISSN 1339-5629

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

The implementing bank will assess the feasibility of the business by the technical bank principles. If the project is feasible to develop, it is necessary to make a memorandum of understanding (Memorandum of Understanding = MoU) that binds each partnering party's rights and obligations (core, Plasma/Cooperative, and Bank). By the memorandum of agreement, under the authorization of the cooperative or plasma, bank credit can be transferred from the cooperative/plasma account to the core account to be further distributed to plasma in the form of production facilities, physical work funds, and others. Thus, plasma will not receive cash from banks but will receive production facilities whose distribution can be through the nucleus or cooperatives. Plasma farmers carry out the production process. The results of the plasma plantations are sold to the nucleus at a price agreed in the MoU. The core company will deduct a portion of the plasma sales proceeds to be handed over to the bank as loan installments, and the rest returned to the farmers as net income.

b. Cooperatives as an Independent Company. The cooperative will provide the production equipment needed for seaweed cultivation, so it is only a matter of installation and planting. In addition, the cooperative will also provide loans for the purchase of seeds and daily needs. All of this will be calculated with the harvest results later, where farmers are only allowed to sell their produce to the cooperative at the prevailing local market price.

3. Regulation of the Overall Trading System for Seaweed by the Industry and Trade Office. The economic marketing of seaweed cultivation lies in the problem of profit and loss resulting from the business. This mainly depends on the high production costs incurred, the amount of production per business unit, and the sale of cultivated products. Until now, the marketing pattern of seaweed products in Indonesia from producers (producers) to consumers is still very long and is determined by middlemen. The length of the marketing chain and the lack of uniformity in prices in an area make the acceptance of seaweed producers very low. As the most experienced government agency in regulating the intricacies of the marketing sector, the Industry and Trade Office can play an active role in establishing an institution whose functions and objectives resemble the role of regional companies in regulating the entire trade chain but also concurrently the role of cooperatives in providing financial assistance to improve welfare fishermen [2,31].

4. Use of Marketplace or Digital Marketing. The marketplace is a solution created from the rapid development of information technology and the internet attacking the trading industry. In this marketplace, every business actor can display their products for sale without the hassle of building a system. [32] State that the existence of a marketplace is very beneficial for business actors who will market their products, especially for seaweed farmers who will market seaweed products. The marketplace can make it easier for seaweed farmers to carry out their operations. With the virtual market, marketing can be done directly to end consumers so that the distribution chain becomes short, and business actors only need to provide complete information about the products they sell in the marketplace, such as product information, prices, shipping, and others.

The criteria and sub-criteria used in the decision model on dealing with middlemen were obtained through brainstorming and interviews with experts and then described in a hierarchical structure (see Figure 2). The following are criteria and sub-criteria for preventing middlemen domination:

1. Financial Aspect: this is an aspect related to the Ability to provide production funds for seaweed farmers, which has been the key to strengthening the existence of middlemen. The sub-criteria from this financial aspect are:

a. Provision of soft loans for production capital. Most of the seaweed farmers in Indonesia have very low-income levels; therefore, to start a seaweed cultivation business, they need a soft loan with a payment scheme by cutting the purchase price of seaweed production.

b. Payment of harvest directly. In general, the carrageenan industry, as the final consumer of dried seaweed products, pays in demand deposits (usually they can be disbursed after two weeks – 1 month). This payment pattern is tricky for seaweed farmers because they need cash payments to pay their consumption debts and replant seaweed.

c. Ability to deal with middlemen. In the interval before seaweed can be harvested and make money, seaweed farmers meet their daily needs by first taking debts to the stalls to buy necessities. The debt is repaid after the seaweed is harvested and produces fruit. It is in this section that the middlemen generally play their role. If there is a disaster that can cause the seaweed harvest to fail, the seaweed farmers will immediately go to the middlemen to get loans to continue to pay their consumption debts. Therefore, by providing consumer credit funds, the role of middlemen can be minimized.

2. Marketing Aspect: relates to the competence to deal with the problems of seaweed farmers in selling their products (dried seaweed). The sub-criteria of this marketing aspect are:

a. Ability to absorb production on a small scale. Seaweed farmers have obstacles to supply directly to the carrageenan industry because the production capacity is much smaller than the supply expected by the carrageenan industry to maintain the continuity of the production process. Therefore, it is hoped that the

Acta logistica — International Scientific Journal about Logistics
Volume: 9 2022 Issue: 3 Pages: 279-290 ISSN 1339-5629

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

production of seaweed farmers on various scales can be absorbed without any problems.

b. Ability to absorb production with superior quality. Because seaweed farmers do not have sophisticated tools to control the water content of the dried seaweed they produce, often the quality of fisherman's products varies because they only rely on intuition. This is what mainly causes the production of seaweed farmers to be rejected by the carrageenan industry

c. Ability to sell products at high prices to users. It is hoped that the strategy to middlemen will be able to negotiate with the industry and significantly increase the price of dried seaweed because it has a better bargaining position than individual farmers.

d. Ability to reprocess production results to standardize quality. To increase the bargaining position so that the carrageenan industry is willing to absorb seaweed products, further processing is needed so that the quality of the various seaweed productions can meet the standard.

e. Wide range of production absorption areas. Infrastructure in coastal areas is very inadequate, but it is hoped that all dried seaweed produced by farmers in remote areas can still be absorbed as a whole.

3. Aspects of Procurement of Production Raw Materials: includes the ability to provide all needs for seaweed farmers when they carry out production activities or during the production period. The sub-criteria from this aspect of the procurement of raw materials for production are:

a. Ability to procure raw materials for production at low prices and good quality. Sometimes seaweed farmers are tricked by traders who sell tools and raw materials for seaweed production at stifling prices in credit schemes. It is hoped that farmers' needs for dry seaweed production can be met at a reasonable price in the future.

b. Availability of raw materials for continuous production. Often there is a shortage of tools and raw materials for seaweed production at a particular time, so seaweed farmers both from a financial perspective and from a credibility perspective in the eyes of the carrageenan industry are not good.

c. Distance of production raw material supply. It is hoped that the Availability of tools and raw materials for seaweed production can be available in areas with inadequate transportation facilities and infrastructure.

4. Information and Technology Aspect: the purpose of this aspect is to directly reach external parties such as suppliers and company consumers to make seaweed marketing more effective and efficient. The sub-criteria from the aspect of technology and information are:

a. Ability to provide an attractive online sales platform. It is hoped that it will be able to provide an online sales platform for consumer seaweed production to attract attention.

b. The Ability to provide a more straightforward transaction system. They have provided access for consumers to conduct transactions both electronically and physically.

c. Ability to deliver goods quickly, precisely, and smoothly. It is hoped that it will provide industrial support services in the delivery of seaweed needed by consumers today.

4.2 Processing with Liberatore scale

Based on the previous explanation above, the results of the questionnaire recap, which were divided into several respondents, were combined and processed using the geometric mean approach to obtain the corresponding consensus pairwise comparison judgment matrices [23], [24]. The results of the AHP data processing for the pairwise comparison assessment matrix of the problem of overcoming and preventing the dominance of middlemen in seaweed cultivation are shown in Table 3.

Each matrix is calculated with the maximum lambda value (λ_{max}), Index Consistency (CI), and normalization to obtain priority weights for each criterion and sub-criteria. Table 3 also shows the consistency ratio (CR) values of each Pairwise Comparison Judgment Matrix (PCJM) are all less than 0.1, which means that the answers from each respondent are consistent for the paired comparison matrix assessment [23,24].

The local weight is obtained from the average value of each sub-criteria to get the global weight value obtained from the product of the local weight value of the sub-criteria with the local weight value for each criterion shown in Table 4.

Furthermore, for the strategy weighting assessment, the method used is Liberatore with five priority weighting scales, namely Outstanding = 0.513, Good = 0.261, Average = 0.129, Fair = 0.063 and Poor = 0.034. This assessment is carried out based on 14 sub-criteria against existing strategies. Table 5 shows the recapitulation results of score calculations for each strategy to prevent middlemen domination in seaweed cultivation.

Based on the final weight calculation results for each of the strategies in table 5, the strategy "using the Marketplace or doing digital marketing" obtained the highest weight of 0.483. Furthermore, the strategy "Expanding the Role of Regional Companies in Marketing at the Provincial and Regency Levels"(0.241), the strategy "Activating Cooperatives on a District Scale" (0.224), and the strategy "The Department of Industry and Trade Regulate the Overall Chain of Commerce" (0.036). Therefore, it can be said that the strategy of "using the Marketplace or doing digital marketing" is the best in overcoming the problem of middlemen's dominance in the seaweed cultivation business. This is in line with the start of socialization and online marketing training for seaweed farmers and Small and Medium Enterprises (SMEs) scattered in the area by utilizing several existing Marketplaces such as Tokopedia, Bukalapak, Shopee, Lazada, and others. Not only that, but the government can also prepare a policy to expand the role

Acta logistica — International Scientific Journal about Logistics
Volume: 9 2022 Issue: 3 Pages: 279-290 ISSN 1339-5629

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

of local companies in buying post-harvest seaweed and activate district-scale cooperatives in helping farmers by providing access to borrowing capital to start production as proposed [2,6] so that the price game done by middlemen can be eliminated.

Table 3 Pairwise comparison assessment matrix of middlemen domination prevention problems

Goal	FA	MA	APPRM	ITA	**Priority**
Financial Aspect (AF)	1.0	1.0	4.6	2.7	0.409
Marketing Aspect (MA)	1.0	1.0	3.1	1.0	0.296
Aspects of Procurement of Production Raw Materials (APPRM)	0.2	0.3	1.0	1.0	0.115
Information and Technology Aspect (ITA)	0.4	1.0	1.0	1.0	0.181
		$\lambda_{max} = 4.174$		CI = 0.058	CR = 0.064

Financial Aspect	PSLPC	PHD	ADM	**Priority**
Provision of Soft Loans for Production Capital (PSLPC)	1.0	5.1	6.6	0.715
Payment of Harvest Directly (PHD)	0.2	1.0	3.3	0.201
Ability to Deal with Middlemen (ADM)	0.2	0.3	1.0	0.084
	$\lambda_{max} = 3.100$	CI = 0.050	CR = 0.086	

Marketing Aspect	AAPSS	AAPSQ	ASPHPU	ARPRSQ	WRPAA	**Priority**
Ability to Absorb Production on a Small Scale (AAPSS)	1.0	1.9	1.6	2.0	2.6	0.299
Ability to Absorb Production with Superior Quality (AAPSQ)	0.5	1.0	2.7	2.6	2.5	0.274
Ability to Sell Products at High Prices to Users (ASPHPU)	0.6	0.4	1.0	3.4	3.5	0.225
Ability to Reprocess Production Results to Standardize Quality (ARPRSQ)	0.5	0.4	0.3	1.0	2.2	0.120
Wide Range of Production Absorption Areas (WRPAA)	0.4	0.4	0.3	0.5	1.0	0.082
		$\lambda_{max} = 5.372$		CI = 0.093	CR = 0.083	

Aspects of Procurement of Production Raw Materials	APRMPLPGQ	ARMCP	DPRMS	**Priority**
Ability to Procure Raw Materials for Production at Low Prices and Good Quality (APRMPLPGQ)	1.0	3.2	4.3	0.622
Availability of Raw Materials for Continuous Production (ARMCP)	0.3	1.0	3.1	0.264
Distance of Production Raw Material Supply (DPRMS)	0.2	0.3	1.0	0.114
	$\lambda_{max} = 3.079$	CI = 0.039	CR = 0.068	

Information and Technology Aspect	APAOSP	APMSTS	ADGQPS	**Priority**
Ability to Provide an Attractive Online Sales Platform (APAOSP)	1.0	3.3	6.7	0.652
Ability to Provide a More Straightforward Transaction System (APMSTS)	0.3	1.0	4.8	0.271
Ability to Deliver Goods Quickly, Precisely, and Smoothly (ADGQPS)	0.1	0.2	1.0	0.076
	$\lambda_{max} = 3.084$	CI = 0.042	CR = 0.072	

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

Table 4 Composite priority weights for critical success factors

Criteria	Local weights	Subcriteria	Local weights	Global weights
Financial Aspect (AF)	0.409	Provision of Soft Loans for Production Capital (PSLPC)	0.715	0.292
		Payment of Harvest Directly (PHD)	0.201	0.082
		Ability to Deal with Middlemen (ADM)	0.084	0.034
Marketing Aspect (MA)	0.296	Ability to Absorb Production on a Small Scale (AAPSS)	0.299	0.088
		Ability to Absorb Production with Superior Quality (AAPSQ)	0.274	0.081
		Ability to Sell Products at High Prices to Users (ASPHPU)	0.225	0.066
		Ability to Reprocess Production Results to Standardize Quality (ARPRSQ)	0.120	0.036
		Wide Range of Production Absorption Areas (WRPAA)	0.082	0.024
Aspects of Procurement of Production Raw Materials (APPRM)	0.115	Ability to Procure Raw Materials for Production at Low Prices and Good Quality (APRMPLPGQ)	0.622	0.071
		Availability of Raw Materials for Continuous Production (ARMCP)	0.264	0.030
		Distance of Production Raw Material Supply (DPRMS)	0.114	0.013
Information and Technology Aspect (ITA)	0.181	Ability to Provide an Attractive Online Sales Platform (APAOSP)	0.652	0.118
		Ability to Provide a More Straightforward Transaction System (APMSTS)	0.271	0.049
		Ability to Deliver Goods Quickly, Precisely, and Smoothly (ADGQPS)	0.076	0.014
			Total :	1

Table 5 Recapitulation of Weight Calculation Strategies for the prevention of middlemen

Strategic criteria issues	Global Weights	Expanding the Role of Regional Companies in Marketing at the Provincial and District Levels			Activate District-Scale Cooperatives			Regulation of the Overall Trading System for Seaweed by the Industry and Trade Office			Use of Marketplace or Digital Marketing		
Critical Succses Factors (Subcriteria)		Rating	Score	×GW	Rating	Score	×GW	Rating	Score	×GW	Rating	Score	×GW
Financial Aspect													
Provision of Soft Loans for Production Capital (PSLPC)	0.292	A	0.129	0.038	A	0.129	0.038	P	0.034	0.010	O	0.513	0.150
Payment of Harvest Directly (PHD)	0.082	G	0.261	0.021	G	0.261	0.021	P	0.034	0.003	O	0.513	0.042
Ability to Deal with Middlemen (ADM)	0.034	G	0.261	0.009	G	0.261	0.009	P	0.034	0.001	O	0.513	0.018
Marketing Aspect													
Ability to Absorb Production on a Small Scale (AAPSS)	0.088	A	0.129	0.011	A	0.129	0.011	P	0.034	0.003	O	0.513	0.045
Ability to Absorb Production with Superior Quality (AAPSQ)	0.081	G	0.261	0.021	G	0.261	0.021	P	0.034	0.003	O	0.513	0.042
Ability to Sell Products at High Prices to Users (ASPHPU)	0.066	G	0.261	0.017	G	0.261	0.017	P	0.034	0.002	G	0.261	0.017
Ability to Reprocess Production Results to Standardize Quality (ARPRSQ)	0.036	O	0.513	0.018	G	0.261	0.009	P	0.034	0.001	G	0.261	0.009
Wide Range of Production Absorption Areas (WRPAA)	0.024	G	0.261	0.006	G	0.261	0.006	P	0.034	0.001	O	0.513	0.012
Aspects of Procurement of Production Raw Materials													
Ability to Procure Raw Materials for Production at Low Prices and Good Quality (APRMPLPGQ)	0.071	O	0.513	0.037	G	0.261	0.019	P	0.034	0.002	A	0.129	0.009
Availability of Raw Materials for Continuous Production (ARMCP)	0.030	G	0.261	0.008	G	0.261	0.008	P	0.034	0.001	O	0.513	0.016
Distance of Production Raw Material Supply (DPRMS)	0.013	G	0.261	0.003	G	0.261	0.003	P	0.034	0.000	A	0.129	0.002
Information and Technology Aspect													
Ability to Provide an Attractive Online Sales Platform (APAOSP)	0.118	G	0.261	0.031	G	0.261	0.031	P	0.034	0.004	O	0.513	0.060
Ability to Provide a More Straightforward Transaction System (APMSTS)	0.049	G	0.261	0.013	G	0.261	0.013	P	0.034	0.002	O	0.513	0.025
Ability to Deliver Goods Quickly, Precisely, and Smoothly (ADGQPS)	0.014	O	0.513	0.007	G	0.261	0.004	P	0.034	0.000	O	0.513	0.007
Total Scores				0.241			0.211			0.034			**0.455**
Renormalized Scores				0.256			0.224			0.036			**0.483**

5   Conclusions

This study assesses various strategies in preventing the role of middlemen in seaweed cultivation in Seram Bagian Barat (SBB) Regency, Maluku Province, using the AHP technique approach. The main obstacle faced by seaweed cultivators in developing their business is the dominance of middlemen who have roots in seaweed cultivators, so this requires serious handling from various related parties such as the cultivators themselves, the government, and other relevant agencies to formulate strategies for dealing with middlemen.

The results of the AHP calculation show that the strategy chosen is the strategy "Using the Marketplace or doing digital marketing," getting the highest weight of 0.483. The strategy "Expanding the Role of Regional Companies in Marketing at the Provincial and District Levels"(0.241), the strategy "Activating Cooperatives by District scale" (0.224), and the strategy "Department of Industry and Trade Regulate the Overall Chain of Commerce" (0.036). Strategies to opening a Market Place or doing digital marketing are expected to break the chain or prevent the domination of middlemen in the seaweed cultivation business. This strategy is also easy to use by farmers or cultivators because it utilizes several marketplaces that are already available without having to build the system. Also, the use of this marketplace has been supported by internet network infrastructure that has reached these areas.

This research, of course, has limitations with the subjective AHP model. However, this research can be developed by integrating several MCDM methods such as Technique For Others Reference by Similarity to Ideal Solution (TOPSIS) and Data Envelopment Analysis (DEA) to get more objective results. In the future, this research can be continued by using the Supply Chain Operations Reference (SCOR) model to measure the performance of the seaweed supply chain in Seram Bagian Barat Regency. It can then be combined with the House of Risk method for managing seaweed supply chain risks so that the government can take appropriate and strategic steps to improve the welfare of coastal communities, especially seaweed farmers.

Acknowledgement

References

[1] Badan Pusat Statistik Provinsi Maluku, Provinsi Maluku dalam Angka, Ambon, 2021. (Original in Indonesian)

[2] PRASOJO, D.: *Usulan Community Development Melalui Usaha Budidaya Rumput Laut Eucheuma sp Berskala Kecil Dalam Rangka Meningkatkan Kesejahteraan Nelayan (Pilot Project di Desa, Pangantap, Lombok Barat, NTB)*, Bandung, Institut Teknologi Bandung, 2018. (Original in Indonesian)

[3] PAILLIN, D.B.: Analisis Kontribusi Komponen Teknologi Dalam Usaha Budidaya Rumput Laut di Kabupaten Seram Bagian Barat, *ARIKA*, Vol. 7, No. 1, pp. 1-14, 2013. (Original in Indonesian)

[4] WARELLA, S.Y.: *Analisis Rantai Nilai Komoditas Rumput Laut (Studi Pada Kabupaten Seram Bagian Barat)*, Salatiga, Universitas Kristen Satya Wacana, 2013. (Original in Indonesian)

[5] WAHYULARASSATI, A., SUSILONINGTYAS, D., HANDAYANI, T.: *Value-chain distribution of seaweed production in Amal Coast, Tarakan Island*, IOP Conference Series: Earth and Environmental Science, pp. 1-6, 2019. https://doi.org/10.1088/1755-1315/311/1/012082

[6] RUSTIDJA, E.S., PRIMIANA, I., ODE, I., PADANG, A.: *Strategi Pengembangan Supply Chain RUmput Laut Di Kabupaten Seram Bagian Barat Provinsi Maluku*, Prosiding Seminar Nasional: Complexity and Systems Science Dalam Pengembangan Agribisnis Nasional, pp. 97-106, 2013. (Original in Indonesian)

[7] SUDRADJAT, A.: *Budidaya 23 Komoditas Laut Menguntungkan.*, Penebar Swadaya, Jakarta, 153, 2008. (Original in Indonesian)

[8] ASLAN, L.: *Rumput Laut*. Penerbit KANISIUS, Yogyakarta, 1998. (Original in Indonesian)

[9] Kangean Energy Indonesia, Pemetaan sosial di sekitar wilayah operasi lapangan gas Pagerungan, Bogor: Kangean Energy Indonesia Ltd dan Fakultas Ekologi Manusia IPB, 2013. (Original in Indonesian)

[10] ARIADI, S.: Pemberdayaan Masyarakat Kepulauan di Jawa Timur, *Jurnal Masyarakat Kebudayaan dan Politik*, Vol. 14, No. 4, pp. 13-24, 2010. (Original in Indonesian)

[11] WIBOWO, Y., MA'ARIF, M.S., FAUZI, M.A., ADRIANTO, L.: Strategi Pengembangan Klaster Industri Rumput Laut Yang Berkelanjutan, *Jurnal Agritek*, Vol. 12, No. 1, pp. 85-98, 2011. (Original in Indonesian)

[12] Lemlit, Institut Teknologi Sepuluh November, Identifikasi Kawasan Dan Potensi Daerah Tertinggal Di Wilayah Kepulauan Di Jawa Timur, 2000. (Original in Indonesian)

[13] ASTUTIK, Y., SANTOSO, E.B.: Prioritas wilayah pengembangan industri pengolahan perikanan di Kabupaten Sumenep, *Jurnal Teknik ITS*, Vol. 2, No. 1, pp. 25-30, 2013. (Original in Indonesian)

[14] SOETHOUDT, J.M., AXMANN, H.B., KOK, M.G.: *Indonesian seaweed supply chain: analysis and opportunities*, No. 2309, Wageningen Food & Biobased Research, 2022.

[15] SUPARTOMO, HIARIEY, L.: *Analisis Kelayakan Usaha Budidaya Rumput Laut Di Kabupaten Seram Bagian Barat*, Ambon, Universitas Terbuka, 2014. (Original in Indonesian)

[16] NURYADI, A.M., SARA, L., RIANDA, L., BAFADAL, A., MUTHALIB, A.A., HARTATI,

PRIORITY STRATEGIES SELECTION TO PREVENT MIDDLEMEN DOMINATION IN SHORTENING THE DISTRIBUTION CHAIN
Daniel Bunga Paillin; Johan Marcus Tupan; Jacobus Bunga Paillin; Victor Oryon Lawalata; Wilma Latuny

NUR, M., ROSMALAH, S.: Agrobusiness of Seaweeds in South Konawe (Indonesia), *Aquaculture, Aquarium, Conservation & Legislation Bioflux*, Vol. 10. No. 3, pp. 499-506.

[17] TUWO, A., AULIANA, R., SAMAWI, M.F., APRIANTO, R., TRESNATI, J.: *Feasibility Study of Seaweed Farming Kappaphycus alvarezii in Sub-District North Pulau Laut and Sub-District East Pulau Laut Kota baru Regency, South Borneo, Indonesia*, IOP Conference Series: Earth and Environmental Science, pp. 1-12, 2020. https://doi.org/10.1088/1755-1315/564/1/012026

[18] MULYATI, H., GELDERMANN, J.: Managing Risks in The Indonesian Seaweed Supply Chain, *Clean Technologies and Environmental Policy*, Vol. 19, No. 1, pp. 175-189. 2017. https://doi.org/10.1007/s10098-016-1219-7

[19] MAHMUD, M., KAMARULZAMAN, N.H.*: Seaweed Supply Chain Risk Identification in Sabah Using Fuzzy Failure Mode and Effect Analysis,* IOP Conference Series: Earth and Environmental Science, pp. 1-11, 2020. https://doi.org/10.1088/1755-1315/549/1/012096

[20] ROMPAS, J.D.W.: Strategi Pengembangan Usaha Budidaya Rumput Laut Dalam Meningkatkan Produksi Di Pulau Nain Kabupaten Minahasa Utara, *Jurnal Administrasi Publik*, Vol. 4, No. 61, pp. 1-10, 2018. (Original in Indonesian)

[21] PAILLIN D.B., TUPAN, J.M., PAILLIN, J.B., LATUNY, W., LAWALATA, V.O.: Risk Assessment and Risk Mitigation in a Sustainable Tuna Supply Chain, *Acta logistica*, Vol. 9, No. 1, pp. 51-61, 2022. https://doi.org/10.22306/al.v9i1.270

[22] BUDIMČEVIĆ, K., MARCIKIĆ-HORVAT, A., MIMOVIĆ, P.: Measuring Performance of Middle East Airlines–AHP Approach, *International Journal of the Analytic Hierarchy Process*, Vol. 10, No. 3, pp. 391-408, 2018. https://doi.org/10.13033/ijahp.v10i3.595

[23] SAATY, T.L.: *The Analytic Hierarchy Process*, New York, McGraw-Hill, 1980.

[24] SAATY, T.L., VARGAS, L.G.: *Decision Making with the Analytic Network Economic, Political, Social and Technological Applications with Benefits, Opportunities, Costs and Risks*, Berlin, Germany: Springer Science+ Business Media, LLC, 2006.

[25] SAATY, T.L.: Decision Making with the Analytic Hierarchy Process, *International Journal of Services Sciences*, Vol. 1, No. 1, pp. 83-98, 2008.

[26] MAGABLEH, G.M., MISTARIHI, M.Z.: Causes and Effects of Supply Chain Nervousness: MENA Case Study, *Acta Logistica*, Vol. 9, No. 2, pp. 223-235, 2022. https://doi.org/10.22306/al.v9i2.299.

[27] LIBERATORE, M.J.: An Extension of the Analytic Hierarchy Process for Industrial R&D Project Selection and Resource Allocation, *IEEE Transactions on Engineering Management*, Vol. EM-34, No. 1, pp. 12-18, 1987.

[28] LIBERATORE, M.J.: *A Decision Support Approach for R&D Project Selection, in the Analytic Hierarchy Process*, pp. 82-100, Berlin, Heidelberg, Springer, 1987.

[29] TAM, M.C., TUMMALA, V.R.: An application of the AHP in vendor selection of a telecommunications system, *Omega*, Vol. 29, No. 2, pp. 171-182, 2001.

[30] PAILLIN D.B., TALIB, T.: Alternatif Penanggulangan Tengkulak Dalam Usaha Budidaya Rumput Laut Di Kabupaten Seram Bagian Barat, *ARIKA*, Vol. 7, No. 1, pp. 65-80, 2013. (Original in Indonesian)

[31] ASRI, A.: *Strategi Pemberdayaan Petani Rumput Laut Yang Berbasis Kooperasi Di Kabupaten Takalar*, Makasar, Universitas Negeri Makasar, 2017. (Original in Indonesian)

[32] DESIANI, A., IRMEILYANA, I., PUTRI, A.I., YUNIAR, E., CALISTA, N.A., MAKHALLI, S., AMRAN, A.: Pemanfaatan Marketplace Shopee Sebagai Strategi Untuk Meningkatkan Pemasaran Kain Songket, *Jurnal Inovasi Hasil Pengabdian Masyarakat*, Vol. 4, No. 2, pp. 209-2019, 2021. (Original in Indonesian)

Review process
Single-blind peer review process.