Social structure of seaweed farmers in border areas: cases in seaweed farmers in Nunukan Island

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Abstract. Seaweed is one of the commodities of the high economic value of the marine and fisheries sector in the district of Nunukan and it has been well developed. This business has formed a new social structure consisting of capital owners or traders and producers. This research aims to analyze the activity patterns of seaweed farming and the construction of social structures in seaweed farming communities. In-depth interviews were conducted in April 2018 interviewing a total of 83 respondents in Nunukan Island. We analyzed the pattern of seaweed business activities Production on input ownership; Source of acquisition of seaweed business assets; the source of asset capital. We also find that most of seaweed cultivation business based on farmer’s capital and by themselves. However, they use labor for pre-production and post-production from workers in the villages and during production, fewer workers are needed. Furthermore, the social structure of the community in the seaweed business on Nunukan Island can be grouped into 4 levels. namely seaweed wholesaler (1st level); peluncur/small seaweed traders (2nd level), seaweed farmers (3rd level) and seaweed workers (4th level).

1. Introduction
Seaweed is one of the high economic commodities of the marine and fisheries. Nowadays, seaweed is not only used for food commodities, but also used for beauty and medical industries, including pharmaceuticals. Indonesia is one of the countries that has a diversity of seaweeds such as Kappaphycus alvarezi (Eucheuma cottonii), Kappaphycus striatum and Eucheuma denticulatum /spinoseum [1]. The centers for seaweed in Indonesia are Riau, Sumatra, Java, Bali, West Nusa Tenggara, Nusa Tenggara East, Sulawesi and Maluku [2]. In its development, seaweed cultivation is also cultivated in Kalimantan island, especially East Kalimantan and North Kalimantan, especially in districts or cities with coastal areas.

The area of seaweed cultivation in Nunukan Subdistrict was 1,713 ha in 2014 and Sebatik Island was only 19% of the total area of seaweed cultivation in Nunukan District [3]. The social structure in seaweed farming is a source that can determine access to resources for the continuation of the business of seaweed products. Social structures are human products collectively, objectively and relatively autonomous [5]. Structures are abstract relations between social position and as a pattern of real interaction. Thus, they shape the structure in the form of discourse, the rules (norms and customs), social actors other, the actions of...
the social actors, stratification and social groups, as well as physical resources both natural and non natural resources [5, 6].

The study of social structures in the fisheries sector is mostly carried out in the capture fisheries typology and related fishing business [7-10]. From these studies, the social structure of fishing is form of social stratification on groups of fishermen and owners of capital was dominated by the role of patron-client relation. Based on studied of the social structure on fishing communities in coastal ecosystems Karanggongso, Trenggalek, East Java, the changes in the structure were driven by outside influences (individuals, system) or their access toward local environmental changes; the capacity of the social structure that can be seen from the objective indicators (availability of employment and business opportunities to use the fishery resources) and subjective indicators (level of accessibility for people on fishery resources) as well as the critical point that are applicable generally and specifically to fisheries resources [11].

On the other hand, social structure research in aquaculture typologies, especially seaweed farming is rarely done. Researches on seaweed cultivation are mostly done on the production potential [2, 12], seaweed cultivation technology [13, 14], processing seaweed and utilizing seaweed for organic fertilizer [15]. Thus the purpose of this study is to analyze the activity patterns of seaweed farming and the construction of social structures in seaweed farming communities.

2. Material and Methods
The study was conducted in April 2018 in sub-district of Nunukan and South Nunukan. The sub-districts are centers for seaweed production for Nunukan Island. The location is a representation of the border region that has the potential for seaweed cultivation. The type of data collected is in the form of primary and secondary data obtained from observation and interviews with seaweed farmers and seaweed traders. Primary data collected includes social structures in seaweed businesses and patterns of seaweed business activities. Secondary data includes the potential of seaweed production and reports of other activities related to the fisheries sector, as well as the results of previous studies that support this analysis.

Data collection is by survey. Determination of samples of seaweed farmers respondents using purposive sampling technique based on considerations from fisheries extensions staff. Furthermore, 79 respondents were selected as owners of seaweed cultivation and 4 key informants of seaweed traders. The data was analyzed qualitatively, understanding of how and why a phenomenon or reality of communication occurs [16].

3. Results and Discussions
3.1. Patterns of utilization of fisheries resources for seaweed
Seaweed farming has provided economic rents and can absorb labor in Nunukan. Seaweed farming has advantages such as the existence of export opportunities, relatively stable prices, simple technology, a short and fast cultivation cycle, requiring relatively small capital and including labor intensive businesses [17]. The seaweed farming business in Nunukan Regency according to one respondent said that it began in 2007. The technology used came from Pulau Sembilan, Sinjai Regency. Then it developed in 2008 and began to be cultivated by captured fishermen as a side business. Given the promising profits from seaweed business, many fishermen or people from other sector has switched their livelihood to seaweed farmer as main jobs.

Cultivated seaweed in Nunukan Regency is a type of cottoni (Kappaphycus alvarezi) with an average harvest time of 45 days. Cultivation technology uses long line or float in water. Ownership of seaweed cultivation in Nunukan Regency is carried out individually (owned by itself). Assets needed for this business are boats, drying places, seeds, ropes and buoys and stakes or poles. The status of the assets of seaweed cultivation businesses is the majority of their own (88% - 100%) as shown in figure 1.
Figure 1. Respondents ownership of input of seaweed production in Nunukan Regency

Assets owned by the seaweed farmers are privately owned about 47% - 58% (Figure 2). For example, seaweed seed was taken from previously harvested seaweed or borrow from other farmers. This owed seaweed seed will be paid back after harvest as seaweed seed. Based on the field observation, there are no seaweed seedlings in Nunukan Regency. The seaweed seed cultivated from seaweed nurseries that were developed from the selection of varieties or pure strains obtained from the research center/institution will have good seaweed quality [1]. Also, drying places were owned privately with the use of neighbor labor to make the drying floor. Also besides, Ropes and plastic bottles, the farmers acquire these assets and assembled for use as rope ris, ties the seaweed seed and as floats. Used plastic bottles that are used as buoys are imported from Tawau because the quality of plastic from used bottles is stronger.

The capital for seaweed farming for both capital asset and operational assets are 74% private capital (figure 3 and figure 4). The business capital is obtained from the plantation (oil palm) and as an Indonesian workforce (TKI) in Malaysia (Tawau- Sabah). Besides that, the source of capital is also obtained from families who work overseas. This has been reinforced by the position of Nunukan next to Tawau Sabah Malaysia. This makes Nunukan the entrance of legal migrants and \textit{illegal workers}. The development gap between Tawau and Nunukan is an attraction for residents of Nunukan and surrounding areas to migrate to Tawau both temporarily and permanently for economic reasons [18]. The majority of migrant workers who work in Tawau Sabah work in small and medium or companies and enterprises (SMEs) [19]. Indonesian workers work as laborers in plantations, construction and service [19].

Figure 2 . Respondents source of acquisition of seaweed business assets in Nunukan Regency
Figure 3. Capital Sources of Respondent

Figure 4. Respondent’s Operational Capital, Sources, Assets

Seaweed business involves more workers. The need for labor in the research area can be identified on the activities including pre-production phase (such assembly farming facilities and base, tiding up the seeds), production phase (seaweed maintenance in the farm) and post-production phase (harvestings, cleaning all kind of ropes, drying and packing). The labor needed for seaweed production in Nunukan mostly come from Nunukan itself as in Figure 5. Workers needed come from the village at about 60% and about 43% for pre-production and post-production phase respectively. Unlike the case with production activities, 41% of respondents did not use labor to maintain seaweed. Seaweed farmers do not do maintenance seaweed every day and will check the seaweed farms before harvesting seaweed. The relationship between the seaweed farmer and the seaweed worker not from its family is on a daily payment system and or output-based agreement on certain works.

Figure 5. Origin of workers respondents for seaweed cultivation remark: A = Within the Village; B = In Village One District; AB = With The Village & In Village, One Distrik; C = Others

The diversity of labor activities in seaweed farming opens up opportunities for employment, especially Nunukan as an entry point migrant workers to Malaysia. Seaweed farming provides a potential contribution to household income and the involvement of female workers. Women are involved as workers in tiding up seaweed seeds. The wage amount of worker for each rope of seaweed can be explained as follows: workers working on base for seaweed ropes will be paid Rp. 100,000/person/day; For workers who tie seeds will be paid Rp. 7,000-9,000/span of rope, workers plant the seeds in the farm will be paid Rp. 100,000/person/day, Harvesters will be paid IDR 100,000/person/day; wages for workers washing rope will be paid Rp. 1,000-Rp. 2,000/span and wages for drying seaweed will be paid Rp. 200/kg dry seaweed. Involvement of workers in the farming of seaweed will absorb about 25 people/cycle with potential revenue of Rp 1.5 million to Rp 2.5 million/cycle per person [20].
3.2. Construction of the social

Social structure is a complex series of social relations in a society [21]. Elements of the social structure are social status, groups, social and institutional roles. The social structure of seaweed farming on Nunukan Island is divided into large collectors, small collectors or locally called “peluncur”, farmers and seaweed farm workers:

a. Large traders are traders or companies that have a strong financial capital that provide loans to seaweed farmers and or providing loans to small traders or “Peluncur” to buy seaweed.
b. “Peluncur” are small traders who are intermediaries for large traders and act as suppliers of seaweed to large collectors. “Peluncurs” buy seaweed directly from farmers and they already have link and relations with big traders.

The working relationship between farmers and workers generally does not have a special bonding. Workers are paid daily or based on certain output of works:

a. Workers making the rope ris: a person who makes ropes to tied up seaweed seed.
b. Foundation workforce: people who make construction of seaweed cultivation area
c. Manpower during making seaweed seeds in the sea: people who tie up seaweed seeds
d. Seaweed harvesting workers: people who work on harvesting seaweed and usually do it together with seaweed owners.
e. Workers to release seaweed from the ropes after harvesting it
f. Ris rope cleaning workforce: those who do the washing rope ris and cleaning the bottles to be reused as buoys or floats.
g. The labor force for drying seaweed: people who carry out the process of drying and drying seaweed either by hanging or drying on “para-para”.

Collectors have a big role in seaweed farming. Work relations formed in the social layers of seaweed farmers can be grouped into business patterns (without capital dependency) and patron clients. In both patterns, the merchant status will have a higher social status. Farmers who have a working relationship in a business pattern, do not have an obligation to sell to certain traders. In other words, they are free to sell to those who give the highest price. Even though it is free to sell to any trader, the farmers usually sell his seaweed to 3 to 5 traders.

Given the high demand of seaweed, the strategy used by seaweed (processing) companies seaweed is placing people that work with n companies as “Peluncur”. These “peluncur” are usually act as small traders. This was done by local wholesalers by financing the “Peluncur” business. According to information from respondents, the majority of peluncur get capital assistance from companies and each “peluncur” has an average of 2 workers, namely as the laborer and the driver.

Aside from being a seaweed trader seaweed, some big traders also have other businesses related to seaweed such as production facilities providers (rope, bottles, etc). In addition, large farmers usually have assisted smaller farmers or beginners. In general, these traders provide capital assistance in the form of money or production facilities to have linkages with farmers and obtain seaweed from them. The farmers who are given all capital by large traders are required to sell seaweed to them. But farmers who received string and seed capital will do a profit sharing system for their harvests with a percentage of 50:50 or 30:70. Patron-client linkages used by wholesalers to guarantee supply of seaweed to them.

The provision of capital assistance not only to seaweed farmers but also to seaweed trawlers/ seaweed capture fishermen. In Nunukan Island there are seaweed traders are the owners for boats used by seaweed trawlers/ seaweed capture fishermen. To operate this boat, according to the statement the respondent, the boat needs 3 crews. The crewes are usually Butonese and have had experience as mini-trawler
fishermen. The boat owner brought in trawler fishing crews from outside the village because the people in Nunukan already had their own seaweed farming business.

Asset for seaweed capture fishermen businesses including boats and engines (15 PK) for IDR 45,000,000 and nets of 25 pieces for IDR 15,000,000. The trawler fishing day is operational in 1 trip for 3 days with operational costs trip of Rp 600,000. The seaweed catch of trawlers in one trip averaged about 3-5 tons of wet seaweed or 350 kg - 500 kg of dried seaweed. The profit sharing between boat owners and crew is 40% for owners and 60% for crews. The existence of seaweed capture fishermen may create conflict with seaweed farmers. Conflicts that often occur are conflicts of seaweed cultivation paths and fishing grounds areas. It sometimes affects production seaweed. The high yield of seaweed capture fishermen had also created jealousy when the seaweed trawlers catch more seaweed than the farmers. The catches of seaweed is relatively large because of the intensity of seaweed farming in Nunukan, although they have rather low seaweed quality [3].

![Diagram of social stratification of seaweed cultivators in Nunukan Island]

Figure 6 shows the role of traders in the seaweed farming economy. The production of Nunukan Island seaweed farming is marketed to Makassar and Ujungpandang regions with export destination countries such as Hongkong, the Philippines, Malaysia, and several european countries [3]. Our respondents said that seaweed production Nunukan always can be absorbed by the market. The high demand for seaweed markets makes seaweed sellable with various qualities. This has an impact on the selling price received by farmers and the average selling price of seaweed was between Rp. 9,000 - Rp. 13,000 / kg.

Seaweed farmers do not have sufficient knowledge on seaweed quality needed by the industry. The wholesalers exploit this condition by purchasing seaweed with uncompetitive prices. The quality of seaweed is impacted by cultivation techniques, harvest time and drying process. The quality of dried seaweed has a water content of 30-35% [22] and Seaweed farmers in Nunukan Island sell their dried seaweed with a maximum moisture content of 30% [3]. In the process of drying or drying, farmers dry the seaweed using “para-para” made on mangrove land. However, the number of drying “para-para” is not enough compared to the production of wet seaweed. Therefore, this has led to the condition above. Some of
the drying of seaweed harvests is carried out along the road so that it allows the seaweed to be stepped on and exposed to dirt. This has related to the seaweed cleanliness.

4. Conclusion
The pattern of seaweed farming is related to the ownership of production inputs, the source of the acquisition of business assets, asset capital and operating capital, the majority of which come from own capital. Whereas the origin of labor for pre-production and post-production of seaweed cultivation comes from labor in the village and for production does not use labor. The social structure of the seaweed cultivation community is grouped into 4 levels, namely seaweed wholesalers (1st level); peluncur/seaweed launcher (2nd level); seaweed cultivators (3rd level) and seaweed workers (4th level). The implication of the social structure of the seaweed cultivator community creates dependence on the sustainability of the grass cultivation business but has not been able to provide a bargaining position for seaweed farmers.

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