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Evaluating seaweed value chain governance in Indonesia: The case of Madura Island

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Abstract

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Seaweed is a high-value product, which holds significant importance as an industrial and export item from Indonesia. Given the increasing stringent food safety and quality standards in global markets, there is an ongoing exploration to enhance its performance. However, the major producers are smallholder farmers facing challenges related to coordination within the chain and there are quality issues. This paper aims to empirically evaluate the governance of seaweed value chain in Indonesia. This paper particularly examined the maturity level of governance practice by focusing on vertical coordination, horizontal coordination, and the flow of information. A qualitative method was applied in Madura Island as a leading producer area in East Java, involving around 31 interviews (value chain players and stakeholders) and focus group discussion (FGD). The results confirmed that the seaweed value chain governance was operated in a low maturity-traditional system, despite the seaweed export orientation. The key players in Madura Island are farmers and traders with limited vertical coordination and asymmetrical information flow, thus providing the least value. The absence of large-scale industry in the study area has led to the limitation of chain performance in the island. Large-scale manufacturing companies are majorly from Java Island, which have control over the chain. Horizontal coordination is also insufficient to support farmers. The paper proposes to transform the practice into a managed chain and provides policy recommendations to facilitate governance practices improvement through standardised quality, information sharing-communication, farmer group empowerment, and sustainable practice.

Keywords: governance; value chain; maturity level of practice; seaweed; Madura Island

Introduction

Seaweed is considered a high-value commodity, typically used in the production of carrageenan and agar, a substance in high demand by key industries and exporters (Neish, 2015). The products are not only used for food products but also medicine, fertilizers, and animal feed (Heijden et al., 2022). Indonesia is one of the important world exporters of seaweed products. The country boasts immense potential for seaweed production, with approximately 8,300,000 km2 of territory, consisting of 77.11% sea waters and 22% land. Statistics Indonesia (2021) revealed that the production in 2020 reached 5,011,856 t of wet seaweed. The primary export markets for seaweeds are China and the Philippines (Heijden et al., 2022).

Despite the importance of the product, the development of the seaweed sector continues to be an ongoing exploration. As the matter of fact, around 90% of seaweed exports from producer countries like Indonesia is raw material (Saputro et al., 2021) and there are quality issues (Rimmer et al., 2021). The seaweed value chains have also indicated an imbalance practice among players. It is because there are typically problems in regards to differences in market power and interdependence between players that influence the ef-

fectiveness of the chain (Suryana et al., 2023). Particularly, it happens when the primary suppliers of raw materials involve smallholders. Smallholders frequently find themselves disconnected from activities in the chain and occupy the weakest position among the players (Hidayati et al., 2021b; Thorpe, 2018).

Some scholars (Gereffi et al., 2005; Hidayati et al., 2021c; Kaplinsky & Morris, 2000) suggest advancement of value chain management through governance improvement. Governance practice enhancement in the chain also frequently leads to value-adding activities (Hidayati et al., 2021c). Suryana et al. (2023) revealed that the primary goal of value chain governance is to ensure that all players in the value chain collaborate effectively and efficiently, aiming to create value for customers while maximizing profits for all participants. Therefore, governance identification deals with understanding the chain arrangement such as where the power is distributed, and how the chain is controlled and coordinated (Mishra & Dey, 2018).

To do so, value chain mapping is often used as tools. Value chain mapping capable of diagnosing comprehensively a wide range of activities from local to global markets and identifying the stages that potentially contribute to adding more value (Gereffi et al., 2005; Hidayati et al., 2021c; Kaplinsky & Morris, 2000; Trienekens, 2011). Some studies have also conducted value chain mapping to understand the governance system in the seaweed chain (Heri Purnomo et al., 2021; Neish, 2015). However, evaluating governance activities without a clear structure of practice can lead to uncertain strategy recommendation. Assessing the maturity level of governance practices is crucial for pinpointing gaps in practice and for facilitating more effective integration of the various players within the chain. Hidayati et al. (2021c) have devised a maturity level of practices in the developing countries' value chain, focusing on three key aspects: vertical integration, horizontal integration, and information flow. This maturity model comprises three levels: the traditional chain system that indicates limited integration; managed chain practices that indicate moderate integration; and best practices that demonstrate full collaboration among the players. Understanding the maturity level of these practices is also critical for gaining insights into their practices evolution (Lahti et al., 2009).

Using the maturity level tool, the paper aims to assess and evaluate governance activities in the seaweed value chain on Madura Island. This research will help bridge the gap in understanding governance practices, enabling policymakers to better intervene and improve the chain. The paper is organized as follows. The methodology is presented the Section 2, while Section 3 will present the results and discussion. Section 4 will encompass the conclusion, including a discussion of limitations and suggestions for future research.

Methodology

This study was conducted on Madura Island, Indonesia, a leading seaweed producer in the East Java province of Indonesia (Figure 1). The island produced approximately

Fig. 1. Map of Indonesia (highlighted in red: Madura Island)
Source: CIA, 2021

663,470.72 t in 2022 (Department of Communication and Informatics Sumenep Regency, 2022). The shoreline in the east part of Madura is suitable for seaweed farming (Neish, 2015), and Sumenep Regency was selected as the key producer on this island as it produces around 5% of seaweed raw material in Indonesia. Two Sub-districts (Saronggi and Bluto) were focused on this study based on the suggestion from the Fisheries Agency.

This study applied a qualitative approach. Value chain mapping was used to identify the key actors' roles in the chain (Figure 2), followed by evaluation of governance practice by using the following Table 1. A total of 31 key interviews were conducted, which involved two extension workers from the Fisheries Agency, 17 farmers from Saronggi Subdistricts and eight farmers from Bluto Subdistricts, two intermediaries, and two Small Medium Enterprises (SMEs). Small FGD was held to better understand the role within their activities.

Results and Discussion

Value Chain Mapping

The result of the study shows that there were simple chain players in the activities (as indicated in Figure 3). There are many seaweed farmers, a few traders (intermediaries and wholesalers), and a limited number of SMEs as processors in the local area. Meanwhile, large-scale processing industries are located out of Madura Island, which distribute seaweed products nationally and export markets.

Production – The *Eucheuma Cottoni* (green colour seaweed) predominates among most farmers. Typically, farmers rely on their own seeds or purchase from fellow farmers. They need to prepare good quality of seeds since it is also a critical factor in determining their yield. Farmers practised seaweed farming using floating bamboo rafts. Each individual raft has the potential to yield up to 1 t. Both male and female farmers collaborate in the seaweed production process. Females work in groups nearly every day, from morning to afternoon, to prepare for planting such as getting the ropes ready and setting the seaweed seeds. In the meantime, male farmers are responsible for deploying the raft into the sea, and they also handle the harvesting process. They harvested their seaweed plants on almost monthly basis (between 25 to 40 days). In seaweed farming, gender equity is a critical aspect in the development of practices, as evidenced in other areas such as the Sulawesi region (Agustang et al., 2021).

After harvesting, farmers sell their products either wet or dry seaweed. The price can be significantly different between wet and dry seaweed. The wet seaweed is around IDR 2000-4000 per kg, meanwhile, the dry seaweed could range between IDR 14,000 – 17,000. Dry seaweed has around 40% water content, which took 2–3 days using sun drying system. In some cases, farmers may add salt into seaweed during the drying process. However, the price of plain seaweed is higher than the salted seaweed (around IDR 1000 difference). Some farmers revealed that there are no grading activities because dry seaweed products tend to have consistently blackened appearance, regardless of their quality. Farmer respondents also mentioned that the best method to sell their products is through intermediaries. They will accept any quality. In most cases, farmers will sell their products depending on their immediate financing needs. They prefer this method

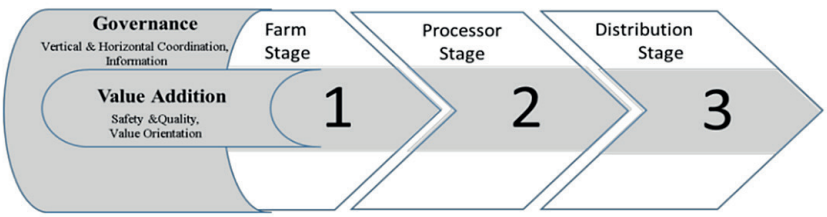

Fig. 2. Value chain mapping
Source: Hidayati et al. (2021)

Table 1. Maturity level of practice in the governance dimension of value chain

Governance item	Traditional	Managed Chain Practice	Best Practice
Vertical coordination	Short-term transaction-based, price-based, no standard, wholesaler channel	Ruled short term-medium transactions, firms as negotiators, upstream standard	Binding medium-long term transaction, collaboration, total focus on consumer
Horizontal coordination	Individual power	Usually relies on other	Interdependence with consumer
Information flow	asymmetry	Some information being shared	Extensive information sharing

Source: Hidayati et al (2021c)

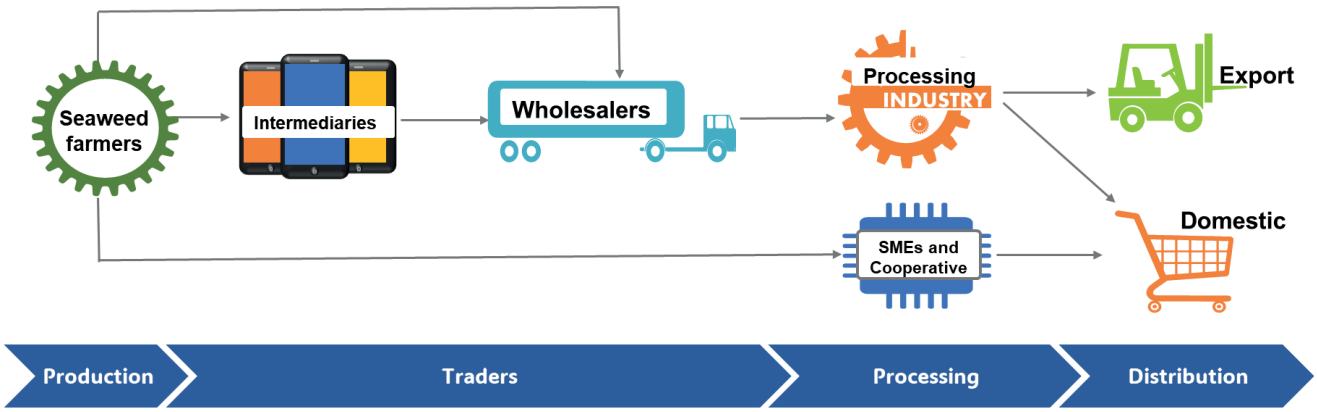

Fig. 3. Seaweed value chain mapping in Madura Island, Indonesia

because they can sell directly and receive payment immediately. Nevertheless, smallholders receive the price set by the buyers, and they do not negotiate. This is likely a common practice in many developing countries, where farmers are often powerless, even with the global value chain scope (Hidayati et al., 2021a; Thorpe, 2018).

Farmer groups exist in the area. Each farmer group typically consists of around 10-15 farmers. These farmer groups serve as a channel through which the government often provides a program to support farmers, including the provision of rafts, ropes, and seeds. Specific to the Saronggi area, there is a head of the farmer group who is also a wholesaler. This key person can do both business connections and government support bridging. However, there are many farmers that are non-farmer group members, especially in Bluto area. There are also associations at the national level called ARLI/ Indonesian Seaweed Association (Neish, 2015). However, there is no further information related to the activity in Sumenep Regency about this association.

Traders – According to the respondents, there are few intermediaries and only around 3-4 seaweed wholesalers in Sumenep Regency. Intermediaries buy seaweed from farmers and then sell it to the wholesaler. The wholesalers then sell the products to manufacturing companies such as in Bali, Gresik, or Pasuruan. Seaweed products are mostly sold in the form of dry quality. The quantity per delivery may range around 30 t or 50 t depending on the request. According to intermediaries' respondents, it is not easy to be wholesaler since it requires much investment to pay the products from farmers.

Processing – Seaweed processing players in the local area are categorised as Small and Medium Enterprises (SMEs) and in the form of cooperative. SMEs is typically the individual family-owned business; meanwhile, the cooperative is based on female farmers' membership, typically wives of seaweed farmers. The cooperative was established by the assistance from the government. Both type of business produced processed food as snacks (such as chips and 'dodol'). Despite the difference of type in operating the business, the practice of processing stage is still under-developed. Demands are very low, which cause non-regular production. Some efforts have been made by the government by ordering their products when there is exhibition or events. This confirmed findings of Revindo et al. (2019), which SMEs are often highly dependent on the governmental support and networking. Some female farmers respondents mentioned that they have been trained to create products as well, but they are not interested in entering the business since they have been busy with their activities. According to them, creating products and doing business will take their time too much. Therefore, when there was training, she referred to letting her daughter join the activities.

Large-scale manufacturing industries and exporters are located out of Madura Island such as Bali, Gresik, Surabaya, and Pasuruan. These businesses are located in strategic areas near export facilities and industrial regions that facilitate their operations. These companies focus on carrageenan production for export purposes. Carrageenan products can be used as food (including beverages) and non-food products (i.e., pharmacy, cosmetics).

Maturity Level of Practice

Given the above characteristics, the evaluation of governance practice based on the maturity level of practice is presented in Table 2. Despite the product that goes to the industries and export markets, the players' practices in Su-

menep Regency of Madura Island are generally categorized as the 'traditional chain system'.

Vertical Coordination

Vertical coordination practice indicated that smallholders play a crucial role in raw material production, but they lack the power and bargaining position necessary for selling their products. This results is similar to the cashew sector case in this study area, where many smallholders serve as producers for export-oriented products, but they are disconnected from the rest of chain players (the industries and exporters) (Hidayati et al., 2021c). Smallholders are generally short-term transactions based. Meanwhile, although the prevailing practice also highlights that the primary consideration is price-based; however, it may not always be the case. There are farmers who sell wet seaweed quality, indicating they emphasized the importance of immediate cash over receiving a better price. This is aligned with the findings of Hidayati et al. (2021a), where the drying process is time-consuming in agri-food products and heavily dependent on natural factors, thus selling their products immediately lowers their risk of getting money although leading to the lower prices they receive.

In addition to that, no standardized product criteria adhered to by the farmers had caused the quality issues. Furthermore, grading activity have been overlooked since the beginning. These often lead to lower price acceptance. The quality problem is exacerbated by the limited availability of high-quality seeds in the region. Therefore, although the United Nations Environment Programme (2023) highlights that small-scale farmers generally yield positive outcomes through seaweed farming, including increased income, diversified livelihoods, and significant improvements in gender equity; in terms of governance, farmers are the most disadvantaged players in the chain, leading to lower quality provision in the initial chain stage.

On the contrary, wholesalers hold the most influential bargaining position in Sumenep Regency, given their ability to connect and sell seaweed products to processing companies. Indeed, in most cases, processing companies prefer to purchase seaweed products in bulk (and graded quality) from wholesalers rather than in smaller quantities from individual farmers (Hidayati et al., 2021a; McCullough et al., 2008). Thus, despite some studies suggesting that intermediaries are not an important agent, respondents consistently emphasize their undeniable and significant role in selling their products. They offer farmers the advantage of selling without venturing too far from their location. The presence of only a limited number of intermediaries points to that the seaweed value chain often works on the foundation of an oligopsony market structure (Neish, 2015).

The absence of large-scale industry in the study area has led to the limitation of chain performance in the island. This is in contrast to the situation in the NTB area, where the products must be sold locally on the island (with local

Table 2. Maturity level of governance practices in the seaweed value chain in Sumenep Regency of Madura Island, Indonesia

Governance	Seaweed Farmers	Traders (Intermediaries)	Seaweed Processors	
			SMEs (snacks)	Manufacturing Companies/Exporter (Carrageenan, agar, etc)
Vertical coordination	Short-term transaction Price-based (no negotiation). No standardised seaweed products (wet and dry seaweed are acceptable) Reliant on the wholesaler channel as buyer	Short-term transaction Price-based (no negotiation). Wet and dry seaweed transaction with farmers (35-40% water content Mostly dry seaweed transaction with companies No grading Reliant on the companies as buyer	Order based transaction and or irregular. Price-based (no negotiation). No standardised product Mostly reliant on order-based buyer	Bilateral relationship transaction with major traders Periodical transaction Standard arrangement: dry seaweed requirements 35-40% water content (with tight checking on foreign material like salt or dirt)
Horizontal coordination	Farmer groups exist but their role is limited to connecting with the government support/program. Individual power	Individual power	Cooperative exists, but their role is limited to connecting with the government support/program. Individual power	Individual power
Information flow	Limited to price information	Limited to price information and quantity requirements from companies	Asymmetrical information	Source of information for price, quantity and quality for players in Madura Island

policy intervention) due to the presence of industrial businesses. It is because many Indonesian seaweed processors are operating below their capacity due to a limited supply of dry seaweed (Heijden et al., 2022). Nevertheless, in general, the manufacturing industry exerts significant control over purchasing activities, including price setting and quantity requirements, as they serve as the primary markets for these raw materials. As Hendrawati (2016) revealed the seaweed price will mostly be determined by the processor companies like those in the Surabaya area.

Horizontal Coordination

Horizontal coordination through farmer group membership in the study area is poorly practiced. Seaweed farmers have their own individual power to practice their farming and decide in any activities. While Maspaitella et al. (2018) mentioned that the group membership benefits included farmers' attendance of farming extension service, access to credit, and access to market information; however, the function of the group in the study area is only relevant to government support access. In the meantime, other than the farmer group, cooperative that exists among the female farmers in the processing food also indicated a passive activity due to reliant on government order when there is a program. However, in this case, Hidayati et al. (2023) pointed out that the characteristic of smallholders in practice can be heterogeneous.

Information Flow

Finally, asymmetrical information happened along the chain. Among the players, smallholders receive little information exchange from other players. They mainly receive price information from intermediaries and or wholesalers. Information on price drives the farmers to sell their products. Meanwhile, farmers have limited knowledge of the quality requirements. Standards for seaweed exports are actually complex, and primarily overseen by the processing industry. Based on Neish (2015), some standards and certifications are required in the seaweed industry, such as the JECFA-FAO/WHO standard for processed Eucheuma Seaweed and Carrageenan, European Union standards (E407a (Processed Euchema Seaweed) and E407 (Carrageenan)), various ISO standards for aspects in food quality, safety and environmental management, traceability, etc. Therefore, information flow should be improved. However, Gardner et al. (2019) highlighted that the impact of increasing transparency of information should be clear, how it is done, the intended audience and the purpose behind it.

Transforming the Seaweed Value Chain Practices

Based on the evaluation of maturity level of practices, the traditional system in seaweed value chain should move towards better practice, which is further illustrated in the Figure 4. In light of this governance practice evaluation, a collaborative effort involving support from industrial businesses, government initiatives, and the public sector is imperative to engage actively in the development of the local seaweed sector. Improving the governance towards a better maturity level of practice will also require a step-by-step approach. As Hidayati et al. (2021c) stated that transforming practices should be done in a sequential manner to establish a clear course of action.

Transforming seaweed value chain practice starts with recognizing the importance of comprehending the quality standards required by the industry. This includes investigat-

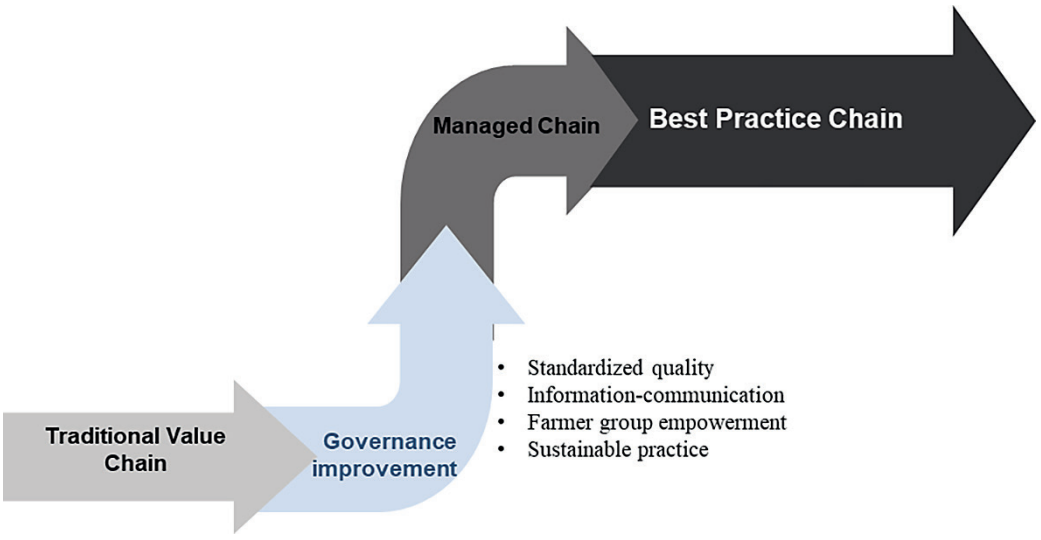

Fig. 4. Transforming seaweed value chain towards better-managed practice

ing a growing requirement in the global seaweed markets. Standardized quality could assist farmers in obtaining better prices for their seaweed. Similarly, some studies (Langford, 2023; Sultana et al., 2023) emphasized the importance of maintaining market prices that motivates farmers to critically engage in the farming system. To do so, improving information-communication throughout the chain is important. This enhancement involves industries' roles through their vertical integration with sources/suppliers. This can be achieved through effective communication of processing industries with the producers, clearly conveying quality requirements, desired quantity, and the necessary practices to meet the required standards. Industrial existence could often elevate local production in terms of quality and quantity. As noted by Rimmer et al. (2021) seaweed industry in Indonesia has largely developed from the 'bottom up', with minimal external intervention. However, this study provides contrasting findings results. There is absence of large-scale industrial facilities in the study area. Thus, wholesalers can play a role in facilitating this process to deliver the information and improve the farmers' practice. Therefore, future exploration of research is needed. It is important to study the opportunity of industrial-level establishment in the island.

It follows that improving horizontal integration is critical, at both the farm production level and processing stage. Farmer groups and cooperatives should receive support not only in the form of equipment but also in terms of institutional development. This includes strategies on how to strengthen their bargaining position when dealing with buyers. It is essential to note that the dynamic nature of the existing relationship of these farmers with buyers, as farmers primarily act as price takers, lacking the ability to negotiate prices due to their reliance on intermediaries (Hidayati et al., 2021a; Hidayati et al., 2023; Trienekens et al., 2018). At the SME level, it is worth noting that the processing industry does not necessarily have to be composed of seaweed farmers. Young entrepreneurs can also seize the opportunity to develop processing operations on a fresher idea of business.

Lastly, raising awareness on sustainable practices across the entire chain is crucial, given the current global shift towards toward increased demand for sustainability driven by concern over food quality and safety. It is essential to note that intensive seaweed farming actually supports global sustainability practices and carbon capture (Heijden et al., 2022; Sultana et al., 2023). Thus, advocating for increased of seaweed consumption at the domestic and regional levels is equally important, as seaweed represents a high-value food source that can benefit the local people in engaging in sustainable practices. As suggested by Merkel et al. (2021), seaweed can also bolster ecotourism efforts in the future by presenting unique local culinary offerings and harvesting experience, potentially inspiring individuals to adopt more sustainable lifestyle.

Conclusion

Evaluating the maturity level of governance helps to better understand the gap of practice in the chain. This study provided additional empirical evidence highlighting governance practices within the seaweed value chain in Madura Island of Indonesia. While the products are mainly integrated into the manufacturing and export chain, it is evident that the prevailing level of practice of players in Sumenep Regency remains at the traditional value chain system in all aspects (vertical integration, horizontal coordination, and information flow). Essentially, three primary players in local area are seaweed farmers, traders (intermediaries and wholesalers), and a limited number of local processing players. Farmers have been identified as the weakest players in the chain, considering their key roles as suppliers of raw seaweed materials. Thus, it is imperative to transform the value chain practices, primarily by shifting towards enhanced and managed-practices. This can be achieved through standardizing quality, enhancing information and communication, empowering farmer group and adopting sustainable practices. Further exploration into how to transition towards sustainable practices is critical, given the current global market trend towards increased pressure for sustainable production and consumption.

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