# THE UPSHOT OF UPGRADING: SEAWEED FARMING AND VALUE CHAIN DEVELOPMENT IN INDONESIA

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAIʻI AT MĀNOA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

IN

GEOGRAPHY

MAY 2017

By

Emily C. Wright

Thesis Committee:

Krisnawati Suryanata, Chairperson
Alison Rieser
PingSun Leung
Ehito Kimura

Keywords: aquaculture, seaweed, value chain, economic development, Indonesia

## Acknowledgements

This research could not have been completed without the assistance and generosity of my advisors, friends, USINDO Summer Studies language instructors, and interviewees in Indonesia, who shared their lives with me. I am especially grateful to Dr. Sitti Hilyana and her family for opening up their home to me, Muhammad Masyarudal Rusdani for connecting me to his network and explaining the ins and outs of the seaweed industry, and Soyan for accompanying me in the field and welcoming me into her family. I am indebted to the key informants in this study, especially Mas Fuji, Pak Ahing, and Pak Jonny, who treated me like a family member and gave me insights into the particular nuances of the local communities. I would also like to thank Via for making me rethink what I know.

Funding was also critical to this research project, as it took learning a new language and two international trips to carry out. For their financial support, I want to thank the East-West Center, Ted and Doris Lee, the American Institute for Indonesian Studies, the UH Center for Southeast Asian Studies, the UH Graduate Student Organization, and the UH Geography Department.

I am deeply appreciative of the support I received from my committee members. Krisna Suryanata, my advisor, provided all the right guidance and insight when it was most appropriate, even when I didn't understand it at the time. Her courses and advising helped me understand, but not resolve, the messiness of this world and those lessons will continue serving me long into the future. Alison Rieser has connected me with opportunities for professional development that have changed the course of my life, and she always offered a boost of support and cheering on when I needed it most. PingSun Leung's expertise was a guiding light in the world of aquaculture and value chain economics, and his willingness to brainstorm with me enabled me to make my envisioned analysis come to fruition. Ehito Kimura endowed me with important building blocks for checking the rigor of my analysis, and in his teaching he offered inspiration and lessons for being a lifelong scholar.

Lastly, I would not have been able to get through graduate school without the support of my peers in the Geography Department and the folks at Hale Manoa and Kuahine, especially Julie, Desiree, and Aurora, who offered laughs, food, stimulating conversations, life wisdom, inspiration, and overall support in this tumultuous experience. I am thankful for Jack for going around the world and back for me, and for my family for loving me unconditionally, listening to whatever I had to say, and always lifting my spirits.

## Abstract

Indonesia is the leading global exporter of seaweed, a raw material used to manufacture a higher value product commonly used in processed foods. The Indonesian government aims to capture that potential added value by developing the seaweed manufacturing sector through liberalization measures, exemplifying a recent trend in global development policy to “upgrade” value chains. Proponents say this approach brings economic benefits to all stakeholders, from small-scale farmers to large manufacturers, yet research has shown that these outcomes are not always realized. This study enters this debate by examining the complex social, political, and economic factors that generate constraints and opportunities for rural seaweed farmers in Lombok, West Nusa Tenggara province as they try to improve their position in the value chain. These findings bear implications for the fate of Indonesia’s development program, and suggest that addressing such institutional factors can support more equitable outcomes across value chains.

## Table of Contents

## List of Tables

## List of Figures

# Chapter 1: Introduction

## 1.1 Perspectives at the foundation of the value chain

*Husen*

In Serewe, on the Indonesian island of Lombok, Husen began farming seaweed 19 years ago after having been a fisherman his entire life. Husen grows seaweed using the floating longline method, which entails two parallel nylon lines attached to large anchored buoys. Strung between these parallel lines are 400 shorter nylon lines with evenly spaced clumps of seaweed attached. Husen harvests his lines on a rotating basis approximately every 45 days and sun-dries the seaweed on a mesh net on top of the beach. This method allows sand and debris to mix in with the seaweed, which reduces the seaweed quality, but it is faster and easier than drying the seaweed on one of the bamboo platforms that were provided by the local government several years ago. Other seaweed farmers in Serewe use similar drying practices, so these platforms often remain vacant. Between July and September, if the season is good, each harvest can produce 500 kilograms of dried seaweed, but poor conditions could halve this amount. Husen's crops are frequently affected by disease and accumulation of other algae that can choke his crop, and sometimes fish graze his seaweed to bits. He sells his seaweed to a local Serewe collector, Jumado, for USD 0.45 per kilogram, earning him USD 112 to 223 per harvest, depending on the season. Usually Husen uses his earnings to pay for household needs and, if needed, farm maintenance. When he has an unusually good harvest and has a more comfortable cash flow, he gives a portion of his earnings back to Jumado as a loan repayment. Husen borrowed his initial capital to start farming from Jumado and has since repeatedly borrowed USD 225 to 300 at a time for farming and household needs, meaning that Husen continually owes money to Jumado. As long as his debt remains, Husen must sell to Jumado, no matter the price. Husen still fishes to supplement his income from seaweed, but recently there has been little to catch. Despite the fluctuations in seaweed harvests, the majority of his income is from seaweed production.

*Bupawan*

Bupawan started seaweed farming in Nambung, West Lombok, in 1995 with financial help from his family. In 2004, he and 9 other farmers organized themselves into a group in order to participate in a program run by the local Department of Fisheries offering technical assistance and supplies for farmer groups in the area. After the initial support ended, the group has continued to exist, receiving other sources of financial and technical support from various public and non-governmental sources, most recently from the International Fund for Agricultural Development (IFAD). Like the other farmers in the group, Bupawan owns his own farm, which is relatively large, consisting of 1,500 nylon lines, each approximately 10m in length, strung between two wooden or iron posts staked into the sand. Clumps of seaweed hang on the lines in this *patok* or off-bottom system. During peak season from August to December, when there are sufficient waves to keep salinity high and little rain washing sediment into the bay, Bupawan can reap 700 kilograms in a single harvest, which he dries for 3 days on a tarp laid upon the beach next to drying platforms that are more likely to be occupied by items other than seaweed. He and his fellow group members combine their harvests to sell to either of the two local collectors in the area, and since they have not taken out loans nor do they have debt with either collector, Bupawan and his group are free to choose which collector to sell to. However, both collectors offer the same price, so their choice is a matter of which collector has an order to fill from a downstream buyer. The current price is USD 0.52 per kilogram, so Bupawan can earn as much as

USD 365 for each harvest. Without debt to pay off, Bupawan and his group keep the majority of their earnings for household needs and farm maintenance, after contributing a portion to a pool of funds for the farmer group. The majority of Bupawan's household income comes from seaweed, but he also raises cows as an alternative livelihood.

*Fuji*

Fuji started seaweed farming only four years ago with his own savings after studying seaweed aquaculture at the largest university in the province, where he learned best cultivation practices and formed connections to people in the regional seaweed market. He has a modestly sized farm of 400 lines using the floating longline system and harvests his lines on a rotating basis every 20-45 days depending on the weather, drying his seaweed in the sun on a concrete slab located down the street from his home. Without any debt, Fuji is free to sell his seaweed to any buyer. However, it makes no difference which of the 10 local collectors he chooses to sell to because he is always offered the same price. If Fuji wants to find a more competitive price, he must leverage his social network to coordinate with local collectors and combine their supply into an amount large enough to sell directly to exporters in Java, leapfrogging 2-3 middlemen in the process. This coordinating role earns Fuji a fraction more than his peers for his seaweed—up to USD 0.02 more per kilogram—which has helped him open a small store in front of his home selling snacks and household goods. These two additional income sources help Fuji weather the volatility that seaweed farming presents due to environmental variability, which recently caused the entire village to suffer crop loss. With these financial resources, Fuji is able to invest in hiring day laborers and has purchased a motor for his boat to increase his production efficiency.

***

These brief profiles share glimpses into the lives of Indonesian seaweed farmers from rural coastal villages on the island of Lombok, the challenges involved in operating seaweed farms, and farmers' options for bringing their seaweed to market. These profiles illustrate considerable variation in seaweed farmers' experiences across Lombok, and even within a single village, in terms of availability of capital, accessibility of government-sponsored supplies, and relationships to buyers. However, these cases also indicate some commonalities, such as: environmental variability that causes instability in harvests and incomes; relatively little variation of farm-gate prices in local markets; and widespread drying practices that tend to reduce the quality of seaweed, despite availability of better tools. These similarities and differences are generated by various economic, social, political, and environmental factors that interact to shape farmers' participation in the seaweed value chain, their ability to increase their benefit, and ultimately improve their well being.

These factors are the crux of this study's analysis as it tries understand how smallholder seaweed farmers in Lombok can benefit from regional and national economic development policies that are trying to upgrade Indonesia's seaweed value chain. This inquiry requires an understanding of seaweed production in particular sites on Lombok, as well as the transformation of seaweed into a value-added commodity within a multibillion dollar global market. It involves examining the relationship between suppliers and buyers in terms of the flow of goods, the distribution of resources and financial goods, and the balance of power between nodes in the value chain. Through these steps, this study aims to shed light on the challenges that inhibit seaweed producers from improving their position in the value chain, and how these challenges in turn constrain the national industry from achieving its value chain development goals.

### 1.2 Focus of Inquiry

The impetus for this study was the Indonesian government's policies that aim to transform the seaweed sector, and the anticipated impacts on local seaweed farming communities and environments ensuing from this change. Indonesia is the leading global exporter of unprocessed seaweed, but the state is aiming to transition the industry to produce value-added export commodities, specifically a widely used food additive called carrageenan. In 2015, the Ministry of Marine Affairs and Fisheries reported that only a third of Indonesia's seaweed exports were partially or fully processed, while 70% was traded in raw dried form (Patutie 2015). Thus, despite being the top supplier, Indonesia loses out on earnings that could be gained from manufacturing these value-added products. This lost potential has captured the attention of central and regional governments. President Joko Widodo announced a plan to ban raw seaweed exports by 2018, bureaucrats are encouraging foreign investment in processing facilities through tax incentives, and rural development projects have provided trainings and tools for processing (Armenia 2015). These initiatives to develop the seaweed industry are one component of Indonesia's "Blue Economy" program—a broad national policy directive, launched in 2013, to sustainably leverage marine resources to drive economic development (Soesilo 2014; USAID 2012).

The government's strategy to develop the value-added sector is a logical transition from primary to secondary markets, a trajectory often taken by developing economies, but it is not without its complications (e.g., Havice and Reed 2012). The impending ban on raw seaweed exports has stirred up concerns that if domestic processors cannot absorb the supply of raw material, seaweed farmers would face a decline in prices (Harrison-Dunn 2015). Meanwhile, economies of scale favor geographically strategic locations for processing facilities near cultivation hubs and export centers, posing questions of how seaweed farmers in remote places such as Lombok will connect to the processing sector (Neish 2013). In other words, there is not a simple relationship between national-level policies to develop the seaweed industry and "on-the-ground" outcomes; rather, various non-policy mechanisms shape the changes that occur in the industry, including market forces, social networks, ecological conditions, and the people engaging in the industry themselves (Mosse 2004). Thus, while a larger processing sector within Indonesia may appear to be a boon for seaweed farmers, this impact cannot be assumed, begging the question: *how will the changes in the seaweed industry affect smallholder producers and rural production systems? How will these changes impact the ecological resource base and access to a larger array of social and political-economic resources?*

In order to answer these questions, we first need to acquire a comprehensive understanding of how seaweed production systems function and how farmers relate to the broader industry. In Indonesia, seaweed is grown across the archipelago in 24 provinces that span a range of cultures and environments. This diversity of social and ecological contexts contributes to variation in production and trade, in turn leading to different impacts from state policies experienced across geographic settings. Capturing all of this variation is beyond the scope of this study. Instead, it focuses on a particular site—Lombok island, West Nusa Tenggara province—to use as a case for how we can examine local seaweed production systems within the broader scale of the industry, or value chain, and then use this understanding to illuminate how large-scale change from state policies may impact local communities and environments. To this end, this study examines the social organization of seaweed production and trade on Lombok. It considers the following sub-questions: (1) what are the institutions or rules that govern access to resources? (2) what are the labor practices? (3) what technology is used and how is it disseminated? (4) what is the market structure? This study approaches these questions from a political ecology perspective, utilizing several theoretical concepts discussed later in this chapter.

### 1.3 Previous work on the Indonesian seaweed industry

Despite the primary role seaweed plays in Indonesia's aquaculture sector and the recent attention it has been given by state actors, the available information on local seaweed production systems and trade in Indonesia is sparse. A large body of descriptive literature, including feasibility studies and program evaluations, matter-of-factly present the current state of the industry using data on seaweed production, cultivation and processing methods, prices, and income generation with little analysis regarding the social and political-economic factors giving rise to current conditions (see Aslan et al. 2015; Hurtado et al. 2013; IFC 2006; Zatnika and Istini 1985; Valderrama et al. 2015). Furthermore, their aggregation of data does not capture how these factors function at the local scale, and interact with other scales in the industry, to produce these outcomes. However, these studies have generated primary data on production statistics, cultivation methods, and seaweed prices that have helped mitigate the dearth of this type of information available at the sub-national level. Thus, these data and studies are useful as reference material and secondary data for other analyses.

A smaller body of literature has sought to deepen the understanding of seaweed aquaculture in Indonesia by conducting richer analyses of social, political, and economic dynamics affecting production systems. Most of these studies apply a sustainable livelihoods framework to analyze the potential or proven success of seaweed development projects in providing alternative sources of income for local residents, specifically fishing households (Crawford 2002; Hill et al. 2012; Sievanen et al. 2005; Zamroni and Yamao 2011). These studies leverage the sustainable livelihoods framework to critically question the assumption that seaweed farming can be uniformly deployed as a development project in different places, whether to create a new income source or to replace a source previously lost due to declines in capture fishery landings and/or more effective enforcement of regulations against illegal fishing practices. The scale of analysis in the livelihoods approach is at the individual household level. Although this scale of analysis appears appropriate given that smallholder producers comprise the seaweed sector, its narrow scope poses a limitation by excluding the broader network of traders, processors, and exporters involved in other parts of the seaweed value chain. Contextualizing production within this broader scale is important to understanding the role of seaweed farmers in relation to other actors and processes that could impact the social and ecological basis of their livelihood. Furthermore, the agency of rural households to accept or reject alternative livelihoods, partly dependent on their access to resources, must be taken into account (Majid Cooke 2004). Thus, while the sustainable livelihoods approach makes a notable contribution to informing effective development programs, their analyses offer limited insights into the functioning of local production systems and their position in the entire value chain.

A few studies have made progress toward filling this gap by using the methodological tool of global value chains (GVC) analysis to examine the different stages of production, processing, and transporting. GVC analysis is primarily used to analyze the type of value chain governance—the relationships between actors involved at each stage of the value chain, determined by their respective share of profits and power. Neish (2007) appears to be the first study to apply this framework to the Indonesian seaweed value chain, specifically in Gorontalo province, but its limitations in time and scope led to generalizations that were not fully supported by its analysis. Neish (2008) analyzes seaweed value chain governance at the national scale and in the global context, but the study's scope is too broad to capture the variation in production and trade throughout the country. Neish (2013) offers an equally broad-scale analysis of seaweed production throughout Indonesia, but includes more specific data about local seaweed markets. The study explores factors affecting value chain governance, such as sources of capital and terms of lending, but the data is presented without an analysis of the social and political-economic mechanisms that affect access to resources and buyer-seller relationships. Furthermore, while the data indicates considerable diversity in production and value chain relations across geographic sites, that diversity is not a focus of analysis in the study. Building on Neish's (2013) study, Mulyati (2015) provides further details about the processes of local production and trading in the seaweed value chain in Indonesia, but there appears a lack of primary quantitative or qualitative data to support its findings.

Collectively, all of the literature on seaweed aquaculture in Indonesia has generated a basic understanding of the current status of production and trade. The studies using a GVC framework offer initial insights into how the seaweed value chain is structured and how local seaweed farmers relate to the broader industry, thus addressing a limitation of the sustainable livelihoods approach. However, several key issues remain under-examined. First, the ecological basis of seaweed production is often glossed over in analyses, leaving important gaps regarding how the environmental conditions and threats affect farmers' decision-making. In addition, the management of marine space, which is held in common property, is rarely addressed, raising questions about how farmers access space for production and how that might be affected if competition increases. Second, few studies have considered social and political-economic mechanisms governing access to natural and social resources, which have important implications for farmers' participation and power in the value chain. Third, there is little acknowledgement of the multi-scaled nature of the seaweed industry and rarely do analyses consider the different factors that become operational at distinct scales, or the linkages between these scales. This study argues that these issues are essential to understanding how local seaweed production systems function and relate to the broader industry in Indonesia, as well as anticipating how national policy initiatives may impact farmers and natural resources. The theoretical approach described in the following sections seeks to bring these matters to the forefront of analysis.

### 1.4 Indonesia's Blue Economy model for economic development

The concept of "blue economy" first emerged in the international development and environmental governance sphere in the year leading up to the 2012 UN Conference on Sustainable Development (UNCSD) Rio +20 Summit (Silver et al. 2015). While the term has been used in various contexts since that time, the Indonesian government has articulated three key premises of the blue economy in its Marine Economic Development Policy under the Blue Economy Model (hereon referred to as the Blue Economy Model or BEM) (KKP 2012). First, the blue economy means harnessing the productivity of the oceans to fuel economic development. The BEM highlights the untapped potential of Indonesia's marine resources and declares that this potential must be utilized for national economic growth, food security, and the public welfare. Second, the blue economy is founded on principles of sustainability. The BEM stresses the inseparability of economic development from environmental resources, calling for a development approach that integrates industrial activities with ecological principles. Third, the blue economy must benefit the Indonesian people. The BEM highlights improved public welfare (*kesejahteraan*) and increased food security as two of its fundamental goals, bringing the policy into alignment with President Widodo's Nawa Cita, or Nine Agenda Priorities, which is founded on the principles of Prosperity (*Kesejahteraan*), Sustainability (*Keberlanjutan*), and Sovereignty (*Kedaulatan*) (KKP 2015).

These three premises comprise the Government of Indonesia's interpretation of the blue economy and provide the grounds for the state's policy strategies for achieving marine economic development goals. The Blue Economy Model proposes growth hubs of clustered marine sector activities, including marine transport, fisheries and aquaculture, energy and mineral resources, and tourism. These hubs are targeted for areas that reportedly have an abundance of marine space and resources that are underutilized; thus the growth would occur on the frontier of resource extraction and utilization. Another strategy in the BEM is attracting investments from the domestic and international private sectors and fostering industries oriented toward export production, which are intended to increase GDP and improve the public welfare. Arguably the core of the BEM is the strategy of value chain development by integrating "upstream" and "downstream" activities in the aforementioned growth hubs and building downstream industries to generate value-added products. The BEM considers these strategies to be integral to sustainable economic development in the 21st century.

*Economic development strategies in Indonesia*

The Blue Economy Model is representative of Indonesia's most recent approach to economic development, which uses new strategies to build on the state's previous approaches adopted during the last half of the 20th century. As described by Wie (2002; 2012), after 1966, the Indonesian government turned away from Communist-leaning policies of the Sukarno administration toward more liberal ones to reintegrate the state into the global economy, access foreign aid to curb inflation, fix crippling physical infrastructure, and develop food and agricultural production. Oil booms in the 1970s generated an influx of state revenue that instigated a shift toward Keynesian development policies, with more government spending on education, basic needs, and transportation and communications infrastructure (Peet and Hartwick

2009). It was during this period when seaweed aquaculture was first leveraged as a poverty-alleviation tool through state development projects. Meanwhile, the state pursued import substitution policies that focused on bolstering domestic industries and placing new terms on foreign investment. The rapid growth enjoyed during this decade came to an end in the 1980s, leading to a rollback in government expenditures and intervention that reflected the global trend toward neoliberal development practices (Peet and Hartwick 2009). Deregulation of the banking sector, trade, and foreign direct investment, as well as other structural adjustments, were put into place to restore macroeconomic stability, but that goal was never fully realized. Instead, financial and political turmoil ensued in the late 1990s that gave way to Indonesia's democratization at the turn of the century. Decentralization brought an influx of state resources to rural governments, which helped support seaweed development projects in coastal communities. Under the Indonesian government's "pro-poor, pro-jobs, and pro-growth" strategy for national economic development during the 2000s, aquaculture gained more attention as a way for impoverished households to improve their well-being and food security by owning the means of production (Herianto et al. 2010; Sunaryanto and Pahlevi 2008). Overall, through the first decade of the 21st century, Indonesia's development approach showed a trend toward what Peet and Hartwick (2009) refer to as "liberal neoliberalism", which has aimed for a smaller role of the state in the market, greater reliance on private sector investment, deeper integration into the global economy, and continued provision of basic services for those in poverty.

In the 2010s, Indonesia's development approach indicates a continuation of liberal neoliberalism, as outlined in its Masterplan for the Acceleration and Expansion of Economic Development of Indonesia 2011-2025 (MP3EI) (CMEA 2011). The MP3EI clearly articulates the central role of the private sector in driving economic growth through investments, including traditionally public sector projects like infrastructure. The state's role is to facilitate this growth with a supportive macroeconomic environment by streamlining and removing regulations that deter or restrict private sector investment and creating fiscal and non-fiscal incentives encouraging investment. While the MP3EI retains a commitment to expanding educational programs and helping the poor by providing basic social services, the largest and most emphasized responsibilities of the government are to "serve the needs of businesses" by providing "equal and fair opportunities for all businesses" (CMEA 2011:28). The Blue Economy Model aligns with the development strategies outlined in the MP3EI. The BEM's growth hubs are analogous to the MP3EI's "economic corridors"—regionally specialized centers of economic growth across the country that capitalize on geographical strengths, maximize the potential natural and human resources, and reduce the development gap between regions. The BEM's plan for economic growth relies on private sector investment and value-added export industries, both of which are pillars of growth in the MP3EI. Most importantly, a core tenet of both the MP3EI and BEM is value chain development that aims to integrate upstream and downstream sectors and transition industries to generate value-added products. This development approach had been initiated in Indonesia during the first decade of the 21st century by international agencies, specifically the World Bank, United States Agency for International Development (USAID), and the Australian Agency for International Development (AusAID), and the MP3EI and BEM indicate its adoption as a foundation for economic development by the Indonesian government (DAI 2011; IFC 2006; Neilson 2014). The value chain approach is a more recent addition to the suite of Indonesia's development policies compared to the other strategies that are in large part a continuation of earlier policies, and thus it deserves more critical attention.

*Value chain development*

Global value chains (GVCs) have emerged as a leading approach to economic development since the mid-2000s. As Kaplinsky and Morris (2001: 4) explain,

> "The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use."

The GVC concept offers "multi-scalar options to link global and local levels," and thus was found to dovetail with post-Washington Consensus development strategies (Gereffi 2014: 26). With the help of scholars who crafted guidelines for conducting value chain analyses, a broad spectrum of international organizations have adopted a GVC framework (Neilson 2014; Werner et al. 2014). Reports from these organizations often herald the capacity of GVCs to "accelerate the catch-up of developing countries' GDP and income levels" (UNCTAD 2013: 148). These goals are achieved by 'upgrading' their position in the value chain, which involves increasing a firm or economy's capacities to move to a more profitable, technologically sophisticated, or beneficial role (Gereffi 1999). To this end, development practitioners and donor organizations recommend incorporating GVCs into the state's overarching development policies, maintaining a positive investment climate, and building local firm capacities (UNCTAD 2013). These recommendations have also been applied to the aquaculture sector, with reports concluding that aquaculture value chains present more employment opportunities than the production stage alone, which specifically benefit "women, the landless, and the socially and culturally marginalized" (Beveridge et al. 2010: 347; also see Little et al. 2012). The embrace of value chain development by international organizations has shaped the global development discourse, thus setting the tone for how countries like Indonesia engage with international actors and approach its own national development, exemplified by the central role of value chains in the MP3EI and BEM (Arfani and Winanti 2014; CMEA 2011; KKP 2012).

Despite the promise GVCs reportedly hold for economic growth and social improvement, value chain development policies have at times failed to achieve their goals, or worse, have exacerbated poor conditions in developing countries (Gereffi 2014). In recognition of these issues, the UN Conference on Trade and Development (UNCTAD) and other international organizations warn developing states and development practitioners that participation in GVCs can pose risks and does not guarantee immediate results (OECD 2013; UNCTAD 2013). A common critique of a GVC approach to development is that too often states rely heavily or even exclusively on trade and investment liberalization, neglecting the suite of complementary policy measures that are required for successfully upgrading in the value chain (Ravenhill 2014). Although international organizations acknowledge such risks, they too are prone to promoting "aid for trade" policies as part of a global development agenda that is more akin to the Washington Consensus than how they present it (Ravenhill 2014: 271). Some scholars blame the shortcomings of value chain development on the selective way in which state and NGOs interpret the critical social science scholarship on GVCs (Neilson 2014; Werner et al. 2014). One primary goal of GVC analysis is to illuminate power relations among value chain actors and how those relationships, as well as institutional conditions, shape the opportunities and constraints of actors to upgrade their position and improve their well-being. Yet the GVC-based policy prescriptions from international development agencies, which are apparent in Indonesia's own policies, lack this critical perspective. Instead, they offer strategies that do not depart from previous neoliberal approaches and thus may perpetuate conditions that have inhibited poverty alleviation and reproduce uneven economic development. Thus, the question remains: can value chain development bring benefits to all actors across the various nodes? Will Indonesia's Blue Economy Model and its pursuit of value-added exports benefit upstream seaweed farmers? Perhaps ironically, these questions are best addressed by returning to the rich literature on GVCs and using a critical analysis to understand the power relations and institutional factors shaping development outcomes.

**1.5 Governance, power, and benefits in the value chain**

Global value chain analysis emerged from the global commodity chains (GCC) framework, which provides a conceptual tool to examine a particular commodity from production to consumption in a globalized network, considering how it is shaped by the institutional framework—the social, political, and cultural factors that vary across places and scales (Friedland 1984; Gereffi 1995). GVCs offer a similar tool for analysis, and thus represent more of a linguistic than a conceptual shift in the literature, according to some scholars (Bair 2009; Nelson 2014). While the GCC framework has roots in dependency and world-systems theories that informed development policies in the 1970s, the GVC framework grew in part out of the changing structure of the global economy and trends in economic development approaches in the post-Washington Consensus era (Bair 2009; Neilson 2014). While there is a critical edge present in both streams of literature that aims to illuminate contradictions in globalized market activities and development practices, and bring social justice and equity to the surface of these conversations, the present study chooses to use the GVC framework because it affords a more direct engagement with seaweed value chain development in Indonesia (Bolwig et al. 2010; Cook et al. 2004; Raynolds 2004).

A core pillar of GCC and GVC analysis is chain "governance," which refers to "the structure of relationships and coordination mechanisms that exist between economic agents in that value chain" (Jacinto Jr. and Pomeroy 2011: 168). Initially introduced by Gereffi (1994), governance has become a way to reveal and explain the distribution of power among actors throughout the chain. Conventionally, governance is based on three key variables that are considered internal to the value chain: (1) complexity of product specifications, (2) ease of codifying product specifications, and (3) ability of suppliers to meet product specifications (Gereffi et al. 2005). Different combinations of these variables generate five distinct governance types, shown in Figure 1.1, each exhibiting a different power dynamic between suppliers and buyers, depicted in the column farthest to the right.

**Figure 1.1 Global value chain governance type and variables**

| Governance type | Characteristics | Complexity of product specifications | Ability to codify specifications | Capabilities of suppliers | Degree of explicit coordination and power asymmetry |
|---|---|---|---|---|---|
| Market | • Low costs incurred by switching buyers/ suppliers<br>• Competitive, and often transitory relationships | Low | High | High | Low |
| Modular | • Turn-key services<br>• Fluid and flexible network of buyers/sellers | High | High | High | ↕ |
| Relational | • Linkages managed through trust and reputation, family, or ethnic ties<br>• Often supported by spatial proximity | High | Low | High | |
| Captive | • Small suppliers dependent on large buyers<br>• Contract-based relationships | High | High | Low | |
| Hierarchy | • Vertical integration of activities under single firm | High | Low | Low | High |

*Source: Adapted by author from Gereffi et al. (2005)*

Value chain governance shapes the opportunities available to agents to upgrade their position in the value chain. Four types of economic upgrading have been defined in conventional GVC literature: *product* upgrading, making more sophisticated products with higher value per unit; *process* upgrading, making products more efficiently through technology or reorganized production systems; *functional* upgrading, adding or changing activities within the same chain; and *inter-chain* upgrading, applying skills to move to a different sector or chain (Humphrey and Schmitz 2001). Upgrading can be pursued by an individual agent, firm, or country, and can occur at various scales—a factory, inter-firm network, or national or regional economy (Gereffi 1999).

Indonesia's Blue Economy plan is an example of functional upgrading, as it seeks to transition from seaweed production to carrageenan manufacturing. The relationship between forms of governance and upgrading opportunities has been shown to be inconsistent in case studies. For example, in aquaculture value chains, captive relationships have been shown to be at times supportive and at other times prohibitive of product and process upgrading, while market governance usually, but not always, opening the way for functional upgrading (Humphrey and Schmitz 2004; Ponte et al. 2014). The governance typology and suite of upgrading processes provide a rudimentary framework to help explain how value chains function, why they exhibit a particular balance of power, and how different actors participate in and benefit from the value chain. However, conventional analyses of governance and upgrading have maintained a narrow scope on variables internal to value chains, precluding an analysis of the broader multi-scale institutional framework to understand how conditions and policies traditionally considered "external" to the chain shape the relations of power and distribution of benefits.[1] The narrow interpretation has diffused into value chain development practices, as international organizations and states have neglected the various complementary policies that are needed to support wide-scale and sustainable improvements for the economy, society, and environment (Neilson 2014; Ravenhill 2014).

*Developing value chain governance theory*

Critical GCC and GVC studies have expanded on the conventional theory of GVC governance and upgrading by considering myriad political, social, economic, and cultural factors, which in many cases were found to be as or more significant than the conventional

[1] Although Gereffi et al. (2005) do acknowledge the role of institutional frameworks in shaping governance, they do not directly incorporate such variables into their theory.

variables in influencing the power relations and upgrading opportunities (see Adhuri et al. 2015; Belton 2010; Bolwig et al. 2010; Danzer 2008; Jespersen et al. 2014; Ponte et al. 2014). When this suite of factors are taken into account, it becomes apparent that upgrading involves both rewards *and* risks, and therefore may not be the best option for value chain participants (Riisgaard et al. 2010). Studies have also expanded the range of actors included in GVC governance analysis by giving more consideration to those who were conventionally considered "external" to the value chain. Some scholars have examined NGOs and international agencies that administer sustainability certification programs, which disturb the governance status quo by creating new product specifications that must be conveyed and met by suppliers (Islam 2008; Tran et al. 2013). Other studies have addressed government agencies, development planners, and local patrons, who often provide trainings, supplies, and financial support to actors in the value chain and thus influence the distribution of resources and power (Kusumawati et al. 2013). Likewise, recent work on upgrading processes has gone beyond economic factors to address the impacts on workers and the environment in an effort to identify concerted steps agents can take to specifically support improvements in workers' lives and reduce environmental impacts, referred to as social and environmental upgrading, respectively (Bolwig et al. 2010; De Marchi et al. 2013; Rossi 2013). A third development from critical GVC scholarship is the acknowledgement of significant variation within value chains. Studies have inquired into the factors contributing to different governance types at distinct nodes along a single value chain, as well as multiple types within each node (Jespersen et al. 2014; Tran et al. 2013).

Among the developments in GVC studies, an especially productive contribution has been made by scholars who have applied a theory of access to understanding value chain governance (see Bolwig et al. 2010; Gellert 2003; McCarthy 2007; Myers 2015; Neilson and Shonk 2014).

While Gereffi et al. (2005: 99-100) acknowledge that “the governance of global value chains is essential for understanding how firms in developing countries can gain access to global markets, what the benefits of access and the risks of exclusion might be, and how the net gains from participation in global value chains might be increased,” critical studies turn the question around, asking how access to markets and other resources shape GVC governance, and lead to constraints and opportunities facing actors at each node along the value chain. The concept of access, emerging from political ecology literature, has been defined as the ability of actors to benefit from resources, such as technology, capital, social status, policies, and property rights (Ribot and Peluso 2003). Actors are able to gain, control, and maintain access to resources through various formal and informal mechanisms, institutions, social relations, and processes—collectively referred to here as mechanisms. These mechanisms shape how actors participate in the value chain, and therefore determines the benefits they are able to derive. Likewise, the way resources are controlled affects how they are distributed and to whom. For example, in a seminal piece on access in commodity chains, Ribot (1998) identifies multiple mechanisms affecting Senegalese woodcutters’ ability to use forest land, including access to a nationally administered permit, which requires a license from a merchant-patron, and access to village infrastructure, which is contingent upon permission by a village chief who is subject to influence from villagers, forestry agents, and merchants. This case highlights two important characteristics of access that help generate a more sophisticated analysis of GVC governance. First, mechanisms of access are often interdependent and nested at different scales. In Ribot’s (1998) case, woodcutters’ could only access a permit from the National Forest Service by first being licensed under a local merchant-patron. Second, mechanisms of access are spatially and temporally dependent, leading to variations in access and governance across sites in a single value chain. Again, in the Ribot

(1998) case, the different wishes and interests of stakeholders in particular areas generates different responses by village chiefs regarding permission for woodcutters. In sum, applying a theory of access to GVC governance generates a more refined tool for analyzing multi-scale and multi-sited GVCs with temporal and spatial variation, and pays greater attention to the social, material, and political aspects that may be considered informal, less explicit, and "external" to the value chain, but are equally if not more influential to its functioning.

Critical literature of GVCs has also illustrated the unreliable relationship between access and realization of benefits, such that even when actors do have access to resources, societal or environmental conditions may prevent them from actually improving their well-being (Béné et al. 2016; Lim 2015; Neilson and Shonk 2014). While conventional GVC scholarship treats such conditions as external to the chain, thus excluding them from analysis, there has been a turn in recent literature toward including them, with the understanding that these conditions are essential to the ability of weak chain actors—such as small-scale producers—to upgrade in the chain. Studies emerging from food security and poverty alleviation literature have articulated this access-benefit disjuncture in terms of Sen's (1999) concept of entitlement (Béné et al. 2016). For Sen, poverty and hunger is as much a function of society and economy as it is of agriculture. Therefore, Sen argues, the focus must not be on the supply of food or other resources per se, but on a person's entitlement, "the commodities over which she can establish her ownership and command" (Sen 1999:162). Entitlement depends on several interdependent factors: endowment, production possibilities, and exchange conditions. A person establishes her entitlement only when she is able to use her assets that are valuable in the market (e.g., labor, land), acquire and utilize available technology and knowledge, and sell her assets or goods at favorable prices relative to different products she must buy. If, for example, a fisherman must sell his catch in order to purchase enough staple food, such as rice, for his family, then an unexpected spike in the price of rice relative to the price of fish could threaten his family's survival. In its application to GVCs, Sen's concept of entitlement complements the theory of access by highlighting additional factors that influence an actor's ability to successfully use the resources at his disposal to improve his well-being. It also illuminates the precariousness of an actor's situation, such that changes in conditions beyond his control can jeopardize his previously stable livelihood.

*Governance and upgrading in seaweed value chains*

Within the last decade, there has been increasing scholarly attention paid toward seaweed value chains. Most studies have analyzed the balance of power among actors in the value chain, and among those that have identified governance types have found instances of relational and market governance (Krishnan and Narayanakumar 2010; Neish 2008). In most cases, seaweed farmers have relatively less power than collectors, processors, or other actors. In Indonesia specifically, the seaweed value chain has been described as generally exhibiting market governance since the 1990s through today, but sub-chain variations in governance were not explored and the power dynamics between farmers and other actors remain to be flushed out (Neish 2007; 2008, 2013; Mulyati 2015).

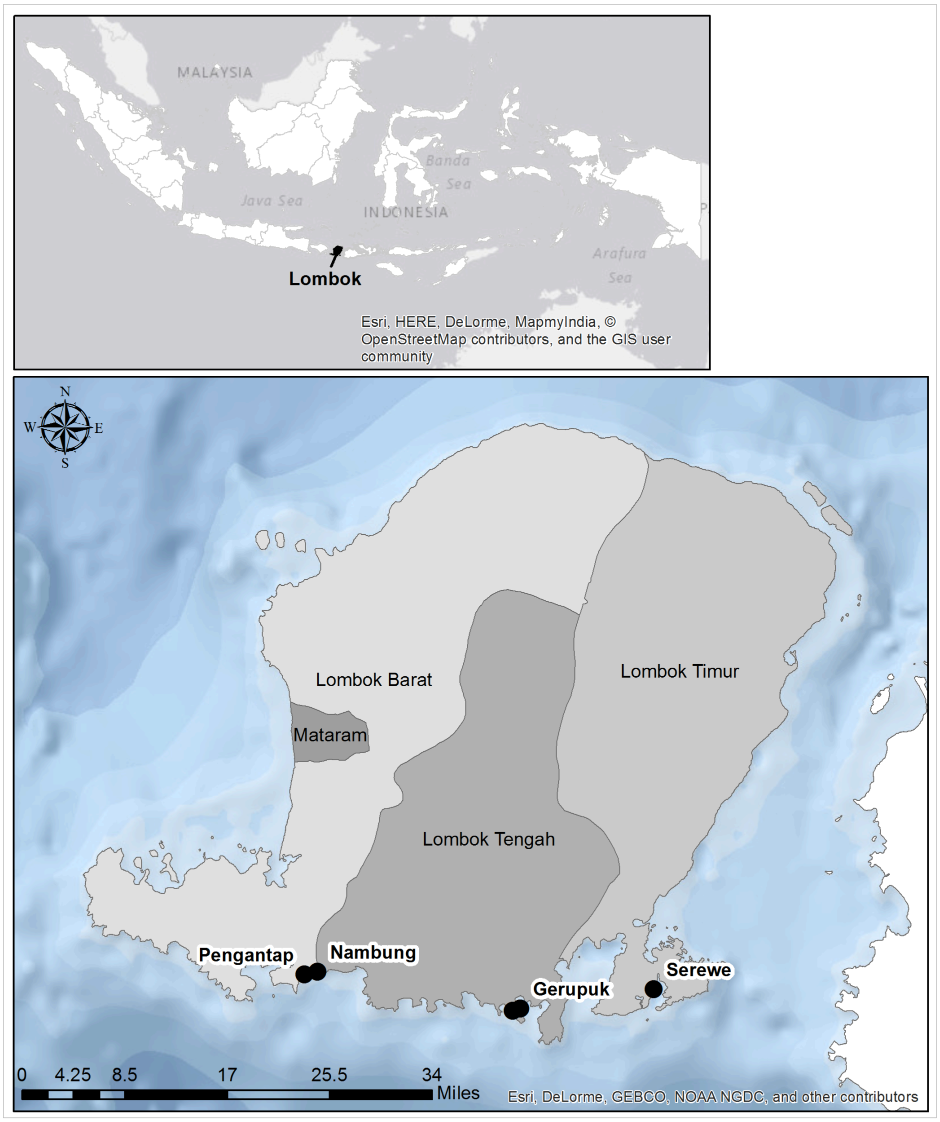
In analyses of seaweed value chains, emphasis has been placed on the institutional factors contributing to the observed balance of power. Most studies utilize a broader understanding of value chain governance, discussed in the previous section, by incorporating variables like private sector investments, health care access, and resource management systems that are conventionally considered exogenous to the value chain. Several themes emerge from this literature that may indicate key contributing factors to seaweed value chain governance. First, access to marine space is identified as essential to farmers' maintaining their power, and communal property rights has been proposed as a promising strategy to secure access (Jacinto Jr. 2004). Second, farmers' power is found to increase when they are organized and coordinate their activities in the market through cooperatives, farmer groups, and other forms of organization (Dávila 2013; Krishnan and Narayanakumar 2010; Neish 2007). Third, access to banking and credit services is critical for empowering farmers to manage their farms effectively and giving them entrepreneurial opportunities for upgrading their position in the value chain (Dávila 2013; Neish 2007). Fourth, pricing mechanisms can impact farmers' market engagement, and if prices accurately reflect the real production costs and reward better products, they empower farmers in the market (Jacinto Jr. 2004, Krishnan and Narayanakumar 2010). Although some of these themes have been identified as factors in Indonesian seaweed value chains, the full range of variables affecting power balance and benefit distribution have yet to be explored.

This study will enter this conversation by using a theory of access and the concept of entitlement to illuminate the different layers of institutional mechanisms and conditions that create constraints and opportunities for actors in the value chain. It will use this access analysis, coupled with analysis of conventional GVC governance variables, to identify the governance type(s) exhibited at various stages in Lombok's seaweed value chain, acknowledging the possibility of variation along the entire chain as well as within each node. This study will examine upgrading opportunities available to Lombok seaweed farmers and the challenges they face. By revealing the complex linkages between actors and scales in the seaweed value chain as well as the dynamic social, economic, and environmental setting in which the chain operates, this study will shed light on how development policies—like those in the Blue Economy model—generate benefits for these actors. This study joins in the critical approach to value chain development that the BEM espouses, challenging its assumptions that deeper integration in global markets through value-added export production will improve the well-being for suppliers on the upstream end of the value chain.

### 1.6 Site selection and description

This study's research location is the island of Lombok in West Nusa Tenggara (NTB) province in the eastern half of Indonesia's archipelago (see map in Figure 1.2). Lombok was initially chosen because it plays a key role in national aquaculture development, in general and specifically in the Blue Economy Model. Central Lombok is home to a National Aquaculture Center (one of a handful across the country) that serves as a hub of research that uses the adjacent coastal area as a testing ground for new aquaculture technologies and development programs that may be implemented at the national scale. In addition, Lombok is identified in Blue Economy plans as a place with vast potential for increasing aquaculture production. Only after early conversations with local stakeholders and field observations did it become apparent that seaweed farming makes a considerable contribution to Lombok's economy, and relative to other aquaculture, it is a more common livelihood activity and has contributed to a particular way of life in many coastal communities. Furthermore, the seaweed industry was receiving more development support from local and national governments than did other aquaculture industries. After considering all of these factors, Lombok appeared to be a logical location to examine the relationship between value chain development policies and the opportunities and constraints facing local producers who are expected to benefit from these policies.

**Figure 1.2 Location map of research sites on Lombok**




*Sources: Created by author.*

Lombok and the island to its east, Sumbawa, comprise West Nusa Tenggara (NTB) province. Basic physical and social characteristics are listed in Table 1.1. Lombok's coastline is characterized mostly by beaches stretching along large bays separated by rocky bluff headlands. Located east of the Wallace line, NTB has a drier tropical climate in relation to western Indonesia. Southern Lombok, where seaweed is cultivated, tends to experience drier conditions, but these coastlines experience significant runoff when rivers carry rainfall from the Mount

Rinjani area in the north-central part of the island to the ocean. There is a strong seasonal rainfall pattern due to monsoonal seasons: the dry season generally occurs from May to October and the rainy season from November to April. The warmest period usually occurs during the seasonal transition between September and November.

**Table 1.1 Physical and social characteristics of Lombok, NTB**

| | |
|---|---|
| Land area | 4,739 km² |
| Marine area | 2,881 km² |
| Coastline | 476 km |
| Annual rainfall | 1,000 - 2,000 mm / 87 rainy days |
| Temperature range | 30.9 - 32.1ºC max / 20.6 - 24.5ºC min |
| Humidity | 48-95% |
| | |
| Population, 2014 | 3,352,988 |
| Human Development Index | 0.6554 |
| Average life expectancy | 66 years |
| Average length of schooling | 6 years |
| Annual per-capita spending | 9.8 million IDR / US$ 734 |
| Poverty rate | 17.10% |

*Sources: Physical parameters, DKP-NTB (2013); Social parameters, BPS-NTB (2015)*

**Table 1.2 Population of Lombok, by regency/city, 2014**

| Regency/City | 2014 | Percentage of total Lombok population |
|---|---|---|
| West Lombok | 644,586 | 19.2% |
| Central Lombok | 903,432 | 26.9% |
| East Lombok | 1,153,773 | 34.4% |
| North Lombok | 210,133 | 6.3% |
| Mataram City | 441,064 | 13.2% |
| | | |
| Total Lombok | 3,352,988 | |
| Total NTB | 4,773,795 | |

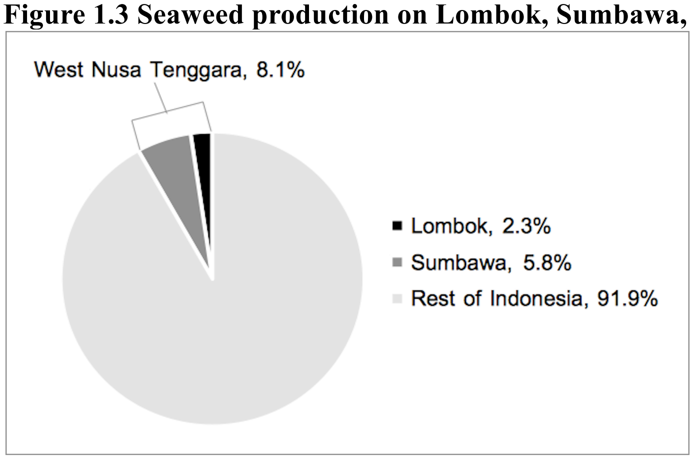
*Sources: BPS-NTB (2015)*

The provincial capital, Mataram, is the most densely populated area, with approximately 13% living in the city. The majority of the Lombok population reside in the four surrounding regencies (*kabupaten*), listed in Table 1.2. These regencies are responsible for supporting

Lombok's main industries of agriculture, fisheries (including aquaculture), mining, and the rapidly growing tourism sector that thrives off the trekking in Mount Rinjani and the coastal activities in the popular three Gili Islands. However, quality of life indicators are consistently higher for the city of Mataram compared to the outlying regencies, presumably due to greater availability of health, education, economic, and other resources. These services attract students from rural areas to attend university and technical schools in Mataram, after which they often return home, bringing skills and knowledge back to their community.

Lombok makes a small contribution to the total seaweed produced in the province as well as in Indonesia, as depicted in Figure 1.3.[2] Seaweed is produced in three regencies on Lombok: East Lombok, West Lombok, and Central Lombok. In consultation with local research collaborators, a specific site was chosen in each of these regencies in order to acquire a comprehensive picture of seaweed value chain on Lombok that would shed light on variations and similarities across the geographic scope.

**Figure 1.3 Seaweed production on Lombok, Sumbawa, and all of Indonesia, 2013**




*Sources: DKP-NTB (2013); KKP (2014)*

[2] Seaweed production figures from national and provincial governments have indicated a discrepancy in totals, so the numbers given here should be used as approximations rather than definitive statistics.

*East Lombok*

The majority of seaweed production in East Lombok occurs in its southernmost district (*kecamatan*) of Jerowaru, specifically in Awang Bay (also called Bhas or Ekas Bay) and Serewe Bay, which collectively have the potential to produce 504,490 tonnes of seaweed (DPK-LT 2013). The three other seaweed-producing districts, Keruak, Sambelia, and Pringgabaya, have an estimated production potential of 19,600 tonnes, 19,600 tonnes, and 14,560 tonnes of seaweed, respectively (DPK-LT 2013). The coastline in the Jerowaru district has numerous bays and inlets, as well as small islands (*gili*), creating dynamic marine conditions. The village of Serewe, located in Serewe Bay, was chosen as the research site in East Lombok because it is considered by residents to be the center of seaweed production in this regency, and it is among the largest seaweed production sites in all of Lombok. Nearly all the residents of Serewe are involved in seaweed production either as farmers or hired workers, and many engage in other livelihood activities including fishing, vegetable farming, and animal husbandry. Serewe appears more developed than surrounding villages, illustrated by numerous buildings made of concrete among those made of traditional palm mats. Communications infrastructure is well developed and most of the roadway leading to the village is smoothly paved except for the last segment. An ongoing challenge is access to fresh water, which is transported by truck into the village every week to fill households' large tanks.

*West Lombok*

In West Lombok, seaweed is produced exclusively in Sepi Bay on the southern coast in the adjacent villages of Pengantap and Nambung, Sekotong district. In this study, these villages were treated as a single site due to their proximity and shared characteristics. Sepi Bay is broad and shallow, with a long stretch of beach spanning its entire length. A barrier reef at the mouth of the bay causes waves to break and creates calm waters within the bay itself. Seaweed production is the primary livelihood activity in both Pengantap and Nambung, but additional livelihood activities include fishing, vegetable farming, cattle raising, and gold mining. Despite this economic activity, development has been slow in this area. Many homes and buildings are made of traditional palm mats rather than concrete homes. Consistent electricity has only been available in the past several years; before then, residents depended on solar energy that led to prolonged periods without power during the rainy season. Transportation and communication infrastructure is less developed relative to other districts.

*Central Lombok*

Seaweed is produced along the southern coast of Central Lombok. The core of production occurs in the eastern portion of the Pujut district in Gerupuk Bay and nearby inlets, which offer a diverse range of oceanographic features and marine conditions. The village of Gerupuk, located in the administrative unit of Sengkol, is considered the symbolic center of seaweed production on Lombok because it hosts a national aquaculture and seaweed development center that serves as an important resource for the community, which made Gerupuk a logical choice as a research site for this study. There are a range of other income sources in Gerupuk, including fishing, vegetable farming, animal husbandry, other aquaculture, and tourism, some of which have bloomed in recent years and have led seaweed farmers to abandon their farms—a dynamic discussed later in this thesis. Like Serewe, Gerupuk also faces limited access to fresh water. The communications infrastructure is well developed and transportation is being improved with a new road under construction at the time of this study. The prioritization of infrastructural improvements is bolstered by the flow of tourists and government officials traveling to the aquaculture center.

## 1.7 Methodology

*Data collection*

The data for this study was mostly collected during fieldwork in June to August 2016, although some observational data was collected from preliminary fieldwork in August 2015. During both periods, I was based in Mataram, the largest city on Lombok and the site of the sponsoring organization, University of Mataram (UNRAM). Several trips lasting several days each were made to the three research sites: Nambung, West Lombok; Gerupuk, Central Lombok; and Serewe, East Lombok. The methodological approach generally follows standard qualitative inquiry and ethnographic methods outlined by Cresswell (2007).

This study relies mostly on primary data consisting of: (1) interviews with individuals involved in the Lombok seaweed industry (e.g., farmers, traders), local and central government officials, and researchers; and (2) field observation at sites of seaweed production, processing, and trading. Interviews were held in a semi-structured, open-ended manner, and their topical focus depended on the interviewee's role in the seaweed industry. For example, interviews with farmers focused more on technical production activities (e.g., cultivation methods, volumes of production, seasonal variations), while those with collectors and processors addressed trading practices (e.g., pricing mechanisms, terms of exchange, supplier/buyer networks). Interviews were recorded with permission of participants, following a methodology pre-approved by the University of Hawaii Institutional Review Board (IRB). Care was taken to respect the time and information that interviewees were providing, as well as to respect the social customs and culture of the local communities. Interviewees were selected using a snowball sampling method, which involved being introduced by interviewees to individuals in their social network who could potentially become new interviewees. Research collaborators at UNRAM were the first point of contact who introduced me to key informants at the three research sites. The key informants served as my local guide, introducing me to collectors and farmers, who then introduced me to their network. This method was especially useful for analyzing relationships in the seaweed value chain, since I was able to follow seaweed as it traveled from producer to collector to processor.

Almost all interviews were conducted in the Indonesian language, which presented some challenges. Although I had established an intermediate level of fluency, there was some information that could not be understood even after re-listening to recordings. Some farmers preferred to speak in their native local language—a dialect of the Sasak language in Lombok—and these interviews required the help of a translator. Five different translators provided assistance in these cases: an undergraduate researcher from UNRAM; a local seaweed collector in West Lombok; a local community member and his 17-year old daughter in Central Lombok; and a seaweed farmer in East Lombok. In all of these cases, issues of interpretation and misrepresentation arose. I made every effort to reduce any bias introduced by the translator, but inevitably it is still present in the data. To counteract this bias, I focused these interviews on information that seemed more straightforward, such as quantitative data about prices, rather than information whose meaning could be more subject to interpretation, such as perceptions of equity in pricing mechanisms. The data from farmers reflects this strategy, and as a result, the richest qualitative data comes from other stakeholders. It is important to note that this distribution of data reflects limitations in the methodology instead of in the knowledge and experience of interviewees. In future work, it would be ideal to improve language fluency of the researcher and/or have a single translator, trained in ethnographic methods, as a project collaborator.

The second type of primary data was gathered through field observations at sites of aquaculture production and processing. These observations addressed the physical settings, production methods, labor practices, social interactions, and other information that is often assumed or taken for granted by interviewees. This data helped clarify any points of confusion that may have arisen from language-induced communication barriers in the interviews. I had the opportunity to stay for several nights at a time in each research site, which provided insights into the daily activities and social customs of the community. This data proved to be important context for understanding the range of factors that affect farmers' access to resources, including less direct factors like cellular phone service. My stay at the research sites also helped me establish rapport with interviewees in a short time period. Thus, field observations contributed significantly to this study's analysis.

The empirical data from interviews and field observations were supplemented with statistics on production, earnings, and trade, as available, and secondary data that include policy and planning documents, presentations, news reports, and grey literature. These data were collected through internet searches, literature reviews, and direct requests to government agencies. They informed the analysis of state policies and the broader context of the national and global seaweed industries.

*Data analysis*

Qualitative data from interviews and field observations, as well as some secondary data, were analyzed through a simple coding process using Nvivo software, informed by steps outlined by Saldana (2012). In two rounds of coding, initial themes were identified and then grouped into common categories. The coding process used this study's theoretical framework to search for themes, but also allowed the data to generate themes organically. The themes and categories were analyzed according to the interviewee's position in the value chain (e.g., farmer, collector, processor) or other role (e.g., government employee, researcher) to identify the perspectives and experiences specific to those distinct roles. The data were also analyzed according to the three sites to identify differences and commonalities based on geographic location.

Quantitative data regarding prices and profits at the producer and local collector level were analyzed using simple statistical techniques to calculate means and standard deviations. Figures from the three research sites were compared to determine differences, which were then used as a launching point for considering the range of variables contributing to such differences. Insufficient data on prices and profits at nodes further downstream in the value chain (e.g., regional collector, exporter) precluded an analysis at those levels.

## 1.8 Outline of Thesis

The rest of the thesis is organized as follows. Chapter 2 provides a primer on the basics of seaweed production and manufacturing of seaweed-based products (i.e., carrageenan). It describes the global seaweed value chain and situates Indonesia and Lombok within that international context. The thesis then presents the bulk of its empirical data in Chapter 3, beginning with a thorough description of seaweed production and trading systems in Lombok. It then analyzes the social, economic, political, and environmental factors affecting value chain governance and farmers' participation in the chain. Building on this analysis, Chapter 4 examines the opportunities and constraints facing farmers and the Lombok seaweed industry as a whole when upgrading in the value chain. Chapter 5 concludes the thesis with a discussion of the study's findings and the implications for the future of the seaweed industry in consideration of the state's development plans. It closes with suggestions for future research to continue expanding our understanding of seaweed value chains and, more broadly speaking, the role of smallholder producers in global industries during an era of value chain development.

# Chapter 2: Indonesia's Role in the Global Seaweed Value Chain

## 2.1 Introduction

To most people, seaweed aquaculture is an obscure topic with little relevance to the lives of people around the world. However, upon reading the label of ingredients on a container of almond milk, a jar of facial lotion, or a can of pet food, one will likely encounter "carrageenan," a widely-used additive that is made from certain species of seaweed. This chapter aims to explain the fundamental aspects of seaweed farming, carrageenan production, and the global value chain that connects a vast number of consumers around the world, in all walks of life, to the seaweed farmers in rural, coastal communities in Indonesia. It discusses Indonesia's important role in these industries and the country's hopes of upgrading its position from primarily a seaweed exporter to a value-added carrageenan producer through its Blue Economy development policies.

## 2.2 Indonesia in the global seaweed industry

Approximately 27.3 million tonnes of seaweed (wet weight) were produced worldwide in 2014 (FAO 2016). The largest contributors to global production are: China (48.8%), Indonesia (36.9%), Philippines (5.7%), and North Korea (4.0%) (FAO 2016). There are myriad species of seaweed in cultivation. The most common, by global production volumes, are: *Eucheuma* spp, Japanese Kelp (*Laminaria japonica*), *Gracilaria* spp, Wakame (*Undaria pinnatifida*), Elkhorn sea moss (*Kappaphycus alvarezii*), and Nori (*Porphyra* spp) (FAO 2016).[3] These species' habitat requirements have shaped the geographic distribution of their production; kelp, wakame, and

---

[3] In algae taxonomy, the abbreviation "spp" after a genus name (e.g., *Eucheuma* spp) indicates multiple species grouped together. In addition, Elkhorn sea moss (*Kappaphycus alvarezii*) was taxonomically named *Eucheuma alvarezii* until corrected by Silva et al. (1996), but in production and trade data, it is often still miscategorized as *Eucheuma* spp. See the website AlgaeBase (Guiry and Guiry 2016) for further taxonomical information.

nori can grow in temperate waters and therefore are found north and south of the tropics especially off the coasts of China and Korea, while *Eucheuma* spp, *Gracilaria* spp, and Elkhorn sea moss grow in the tropics, including the Philippines and Indonesia. Another difference between these groups of seaweed is their intended use. Kelp, wakame, and nori are all intended for direct human consumption in the form of sushi, seaweed salads, and other dishes. In contrast, the latter group are processed into other products, some of which become ingredients in human foods while others are used in cosmetics, pharmaceuticals, and pet food industries.

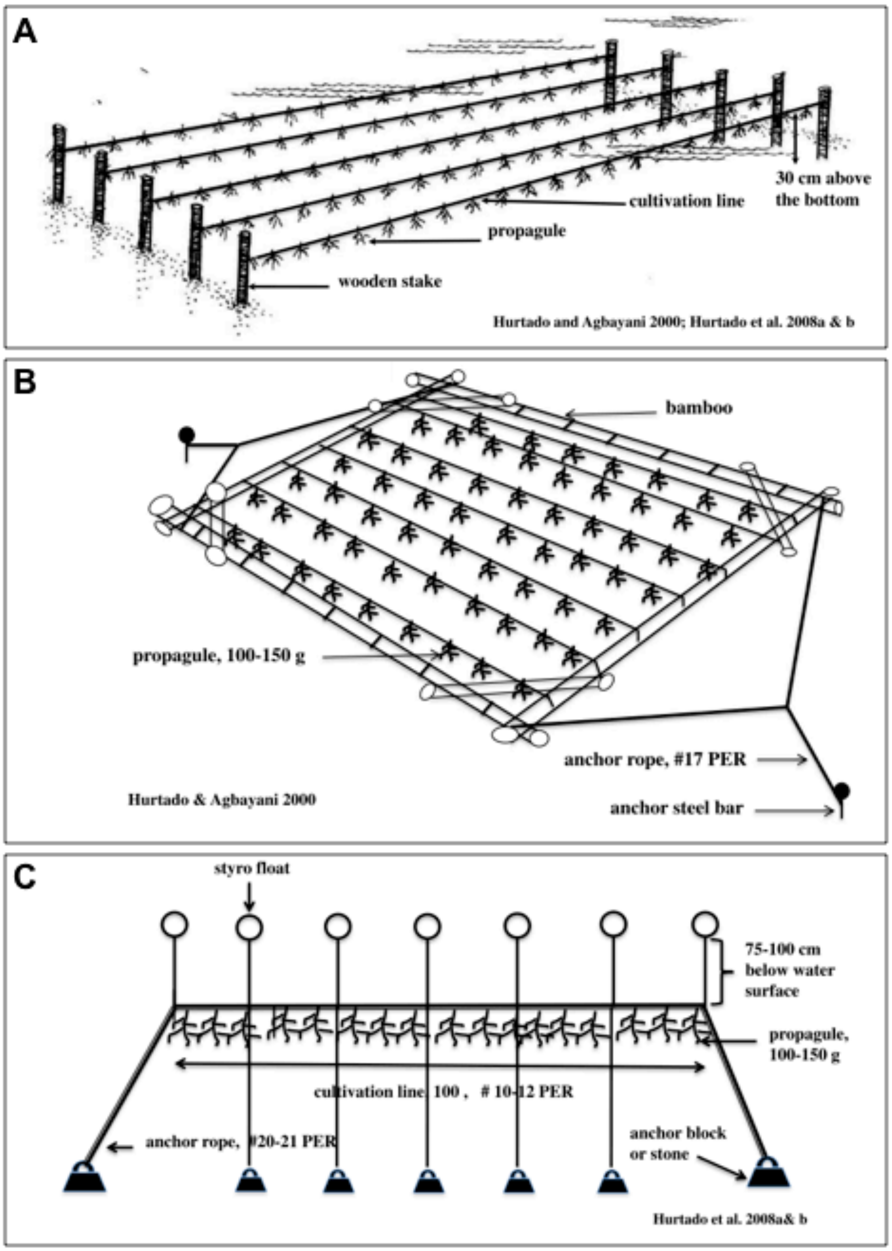
As the second largest producer worldwide, Indonesia generated over 10 million tonnes of seaweed in 2014 (FAO 2016). Nearly all of Indonesia's seaweed is *Eucheuma* spp, with the small remainder being *Gracilaria* spp. In fact, Indonesia contributes 99% of the total global production of *Eucheuma* spp. Seaweed has been cultivated in Indonesia since the mid-1980s after aquaculture technology was transferred from the Philippines, where cultivation methods were first invented (Neish 2013). As new applications for seaweed were identified and processing technologies developed, global demand for raw seaweed grew, leading to the spread of seaweed cultivation throughout Indonesia and an increase in production volumes through the mid-1990s. During this period, the Indonesian government supported seaweed aquaculture as an economic development strategy, welcoming a series of projects supported by international NGOs (Islam 2014; Siar et al. 2002; Yusuf 1995; Zhou 2003). Despite this support, Indonesian seaweed production still lagged behind the Philippines until there was a transition to a stronger democracy around the turn of the century (*Reformasi*). In the new democracy, a favorable investment climate attracted foreign donors and private sector actors, leading to an influx of technology, skills, and capital into Indonesian industries. State decentralization processes helped channel those resources into the hands of local governments and communities. These changes precipitated an increase in seaweed production as a portion of Indonesia's total aquaculture production (by volume) from 5% to 63% between 2003 and 2009, allowing the country to surpass the Philippines to become the largest exporter of seaweed worldwide (LEI Wageningen UR 2012). Over the next 5 years, the country's seaweed production continued a steady upward trajectory to where it is today.

### 2.3 Technical primer on seaweed cultivation

Seaweed is cultivated in coastal waters using farming systems that are chosen based on the oceanographic conditions of the particular farm site, species' habitat needs, and availability of financial resources. On Lombok island in Indonesia, shallow and tidally influenced areas require off-bottom cultivation systems, in which the seaweed hangs about a foot off of the ocean floor to remain in water even at low tide. In contrast, deeper and semi-protected bays are appropriate for floating raft or longline cultivation systems that keep seaweed at the surface of the water. All three cultivation systems are illustrated in Figure 2.1.

These systems create distinct growing conditions for seaweed that offer different advantages for seaweed growth. Seaweed growth and reproduction is related to factors like sunlight, temperature, and nutrients, but the scientific community is still in the early stages of understanding these relationships (Baweja et al. 2009; García-Jiménez and Robaina 2015). Anecdotal evidence from seaweed farmers in this study indicates that optimal growing conditions entail moderate wind and wave action, high salinity, and stable water temperatures. Off-bottom farming systems offer more protection from high winds and intense waves, but the seaweed is at risk of low salinity during the rainy season due to more freshwater entering river mouths. Floating raft and longline systems offer protection from this impact since they are located farther from shore, but they can experience severe wind and wave action that can cause seaweed to break off or come untied from the cultivation infrastructure, leading to crop loss. In addition to these factors, seaweed farmers must consider their financial resources. According to farmers interviewed, floating systems incur more costs than off-bottom systems because of the resources they require for construction, maintenance, and access.

**Figure 2.1 Seaweed cultivation systems utilized in Indonesia**




*A. Off-bottom system, B. Floating raft system, C. Long-line system*
*Source: Hurtado et al. (2013)*

*Production cycle*

The seaweed production cycle begins with seedlings, weighing approximately 100 grams each, which are traditionally clipped from the last 15 centimeters of young seaweed branches, called thallus. The seedlings are tied to lines typically using plastic rafia or nylon ties and attached to the cultivation system. Once set, farmers check on the seaweed periodically, especially if environmental conditions change, but it is a mostly hands-off growing process. After approximately 35-40 days, the seaweed is harvested, new seedlings preserved, and the rest is dried. There are various techniques for drying seaweed. The most basic is laying it on the beach, an open field, or a concrete slab with or without a tarp or netting to protect it from sand and dirt. More advanced techniques involve a drying platform (*para para*) or hanging rack, which are more costly, but keep the seaweed clean of dirt and debris. The drying process lasts 2-5 days, depending on the weather and technique. Once the seaweed is sufficiently dried to the industry standard of 35% moisture content, it is packed into sacks for sale.

Farmers typically harvest seed from their previous crop, saving 30-50% of their production for seed and then drying and selling the remainder. In this way, the clipped-thallus method has generated strains of seaweed that are adapted to local ocean conditions, which has long been considered by local Indonesian farmers to enhance growth. However, local researchers in Lombok believe that this method practiced again and again over the years has led to a seed stock with lower growth potential and greater susceptibility to disease, which Rusman et al. (2013) argue caused declines in Central Lombok seaweed production observed over the past decade. These concerns have spurred research in Indonesia, supported by the government, to use tissue culture (*kultur jaringan* or *kuljar*), a method long used in land plant propagation but first applied to algae only in the late 1970s (Reddy et al. 2008). Seaweed tissue culture allows researchers to select for certain desirable traits and holds significant potential for applications in biotechnology (García-Jiménez and Robaina 2015). However, local researchers in Lombok reported in interviews that there have been challenges growing *kuljar* seed in field settings, which may be due to its lack of adaptation to local environments after having been cultured in a controlled setting. Nevertheless, *kuljar* seed is an alternative source of seedlings for Indonesian farmers who can afford to purchase it.

*Environmental variability*

The timing of the seaweed production cycle and the success of the harvest are affected by seasonal and annual variation in environmental conditions. Most of Indonesia experiences monsoonal seasons, generally characterized by dry conditions and easterly winds during the months of June through October, and wet conditions and westerlies from November through May. Although conditions of the rainy season can vary annually based on the timing of its onset, the rainy season often brings more intense wind and waves that can damage farming infrastructure and the seaweed itself, as well as heavier rain that flushes sediment and freshwater into river mouths, blocking sunlight from reaching seaweed and reducing salinity (Moron et al. 2010). There is anecdotal evidence from seaweed farmers that floating cultivation systems can reduce the impact from sediment and freshwater, but their exposure to wind and waves still pose a challenge. Another strategy farmers take is to stop production when conditions are poor until they turn favorable again. The seasonal and annual variability of environmental conditions is experienced differently across Indonesia due to the diverse geography of the archipelago, but it is consistently a barrier to a stable supply of seaweed. Farmers and collectors reported that production could be two to three times higher during peak season than the rest of the year. This fluctuation, compounded by unpredictability due to annual variability, creates uncertainty in farmers' incomes, leading most seaweed farming households to engage in alternative livelihood strategies, such as vegetable farming and fishing.

*Disease and other threats*

Other factors that affect seaweed production are disease, pests, and weeds. A common disease that has wreaked havoc across Indonesia is ice-ice disease, a bacterial infection that causes seaweed to become white and brittle, resulting in breakage and crop failure. Seaweed is prone to such infection when it is already weakened by poor or abrupt changes in environmental conditions (BBL 2012). Farmers report occurrences of ice-ice in conditions of low salinity, too high of water temperatures, and little water circulation, indicating that the disease could occur in both the rainy season and the dry season. However, the type of cultivation system may reduce exposure to the disease. Off-bottom systems were reported to be more affected by ice-ice than floating systems because they are located in nearshore environment closer to river mouths transporting freshwater into the bay.

Pests may be a problem for seaweed farmers in some areas. Larger herbivorous fish and turtles as well as smaller invertebrates and juvenile or larval animals may graze on seaweed, especially the young thallus or shoots, thus increasing its vulnerability to bacterial infection and leading some farmers to harvest their crop early (BBL 2012). In addition, weeds (known as "bio-fouling") occurs when other algae species accumulate on the cultivated seaweed. When bio-fouling occurs, farmers may try to clean the seaweed, but in some cases algae can grow too aggressively and lead to crop failure.

*Post-production trade*

After seaweed is harvested, dried, and packaged for sale, it is passed along a network of traders, which in Indonesia, usually entails four tiers: local—within one village or among several nearby villages, regional—across a regency or province, national, and international. As mentioned above, almost all of the seaweed produced in Indonesia is *Eucheuma* spp, which are used to make a product called carrageenan—a common ingredient in the manufacturing of dairy products and processed meats, among other products. The majority of the seaweed grown in Indonesia is eventually sold to carrageenan manufacturers outside of Indonesia. In fact, according to the Indonesian Ministry of Marine Affairs and Fisheries, approximately 70% of seaweed produced in the country is exported in raw, dried form to be processed by foreign companies (Patutie 2015).[4] In 2012, this amounted to 168,279 tonnes (dry weight) of seaweed, a value of over US$ 134 million (Sahat 2013). The majority of these goods (67%) were imported by China, while the Philippines, Chile, Korea, and Vietnam imported another 21% combined; the remainder was sent to the United States and various European countries.[5] The other 30% of seaweed grown in Indonesia that is not exported, but rather stays within the country, is sold to processing companies who make carrageenan or other products that contain seaweed, including snack foods and cosmetics.

### 2.4 Carrageenan manufacturing

Carrageenan is extracted from seaweed for its gelling and emulsifying properties. There are three types of carrageenan manufactured commercially: kappa, iota, and lambda. Each type has distinct chemical properties that make it most suitable for particular uses, and they are commonly combined into specific blends to achieve desired qualities. For example, kappa

[4] The amount of seaweed exported as a percentage of production has been reported to be as high as 90%. However, using the most recent statistics available from the Central Statistics Agency, it may be as low as 25%. This discrepancy may be attributable to the over-reporting of seaweed production described in the previous note.
[5] Based on available trade data, it is difficult to determine the exact additional value these countries earn from importing Indonesian seaweed. For an indication of the value the countries earn by manufacturing carrageenan seaweed from Indonesia and elsewhere, see Table 2.1.

carrageenan can prevent separation of cocoa from milk proteins in chocolate milk, while a mixture of kappa and lambda can be added to dry instant hot cocoa mixes to improve the suspension as well as offer a creamy "mouth feel" (McHugh 2003). Iota carrageenan offers a substitute for animal-based gelatins and has become a common additive in processed meats, especially low-fat products to which carrageenan restores tenderness. In addition to human food products, carrageenan has also been used in pet foods, toothpaste, cosmetics, and pharmaceuticals.

Several species of red seaweed produce the different types of carrageenan. *Kappaphycus alvarezii* and *Eucheuma* spp, which produce kappa and iota carrageenan, respectively, account for the majority of global carrageenan production. They are cultivated in Indonesia, the Philippines, Tanzania, and Vietnam, but considering Indonesia produces over 80% of the total global supply of these species, it can be inferred that most of carrageenan worldwide is made from seaweed grown in Indonesian waters (FAO 2014). Other "carrageenophytes" that are in smaller supply are harvested from the wild; these species include *Chondrus crispus* (kappa, lambda) in Canada, northeastern United States, and France; *Gigartina skottsbergii* (kappa, lambda) in Chile and Argentina; and *Sarcothalia crispata* (kappa, lambda) in Chile (McHugh 2003).

To transform raw seaweed into carrageenan is a multi-step process, and there are different methods depending on the intended use and desired grade of the carrageenan. Refined carrageenan (RC) is considered the highest quality grade and is suitable for human consumption. RC is made by washing the seaweed, soaking it in warm water-based solution to extract the carrageenan from the seaweed material, filtering out the residue, and finally, recovering the carrageenan as a solid from the liquid solution. This final step can be carried out either by using an alcohol for precipitation, which is more versatile because it can produce kappa, iota, or lambda, but also more expensive; or by forming a gel with potassium salts and pressing out excess liquid, which is more economic but can only produce kappa carrageenan. Processed *Eucheuma* seaweed (PES) has a lower purity than RC, but is considered by regulatory agencies in the United States and Europe to be of the same grade as RC and thus suitable for human consumption. PES is produced by washing the seaweed; soaking it in a potassium hydroxide solution to produce a gel with the carrageenan and dissolving or removing all proteins, carbohydrates, or salts; washing the residual product, which still looks like seaweed, in water; treating it with bleach to reduce bacteria and remove color; and drying it in a closed system. This process is less expensive than the process to make RC, but unlike RC, it retains the cellulose from the original seaweed, resulting in a cloudy solution that makes it less suitable for certain applications where clarity is a concern (McHugh 2003). Semi-refined carrageenan (SRC) is a lower quality grade and is not suitable for human consumption due to its tendency to retain a high bacterial count after processing. SRC is produced using the same process as PES, except that the seaweed is not bleached after washing with water, but rather dried in an open air location for 2-3 days. After drying, SRC may be milled to produce a flour, or it can be chopped into pieces called alkali treated cottonii (ATC) or cottonii chips as an intermediate step for transporting to a milling facility. The lower quality of SRC/ATC limits its applications to the canned pet food industry. Recent trends in the carrageenan industry indicate that manufacturers are phasing out alcohol-precipitated RC in favor of the lower cost gel-press RC or PES production, while SRC production has decreased, in part due to overcapacity (Bixler and Porse 2011).

*Global carrageenan industry*

The global carrageenan industry has grown considerably in recent decades as research and development efforts have created more efficient processing technologies, like gel-press RC, and have identified new applications for carrageenan (Cai et al. 2013). Between 1999 and 2009, global sales of carrageenan increased by 81%, and by 2014, global carrageenan exports alone were valued at an estimated US$ 1.1 billion (Bixler and Porse 2011; United Nations 2016). The carrageenan industry has also expanded in terms of its geographic range and number of manufacturers. Historically, only a handful of processing companies in the US and EU dominated the market, including CP Kelco, Cargill, CEAMSA, and FMC. However, as processing technology has become more widely accessible, more companies have been entering the market in Asia. Today, most carrageenan manufacturing occurs in China, the Philippines, Europe, and the United States, reflected in export data listed in Table 2.1. As market competition has risen, the basis of competitive advantage has shifted from control over tools and technology to proprietary blends of different seaweeds that target specific end uses (CBI 2015). These blends are often combinations of multiple species and/or strains of carrageenophytes originating from various locations around the world. Although specific data on market share and price differentials of carrageenan blends could not be accessed, industry reports and communications with an employee of a carrageenan manufacturer indicate that such blends are playing an increasingly larger role in the entire carrageenan industry. Some of the larger Indonesian carrageenan manufacturers feature blends on their websites.[6]

[6] For instance, see the websites of P.T. Wahyu Putra Bimasakti (http://www.seaweed.co.id), Algalindo Perdana (http://www.algalindo.com), and Karagen Indonesia (http://karaindo.com).

**Table 2.1 Top global exporters of mucilages and thickeners* 2014**

| | Reporter | Netweight (tons) | Trade Value (US$) |
|---|---|---|---|
| 1 | China | 48,735 | $397,120,557 |
| 2 | Philippines | 26,633 | $213,238,581 |
| 3 | Netherlands | 17,123 | $15,039,312 |
| 4 | Germany | 9,572 | $66,340,635 |
| 5 | Spain | 7,723 | $71,761,729 |
| 6 | USA | 6,234 | $80,469,359 |
| 7 | India | 5,944 | $11,907,251 |
| 8 | France | 5,839** | $82,660,002 |
| 9 | Indonesia | 4,933 | $38,847,809 |
| 10 | Chile | 4,811 | $72,505,971 |

*This category is used in trade statistics and includes carrageenan, and unfortunately the specific amounts and value of carrageenan trade cannot be determined. However, since carrageenan represents the largest share of this category, this data is presumed to be fairly representative of its trade flow.
**Estimated amount
*Source: United Nations (2016)*

The carrageenan industry has the potential to continue growing if there is a renewed investment in research and development to uncover new applications, increase processing efficiency, and improve carrageenan blends to offer texture and consistency properties desired by processed food manufacturers (Bixler and Porse 2011). Even with these developments, significant barriers remain in regards to seaweed production, including: 1) inconsistent seaweed supply due to environmental variability and disease, and 2) price instability attributable to poor communication of market information (Bixler and Porse 2011).

An additional challenge for carrageenan manufacturers hoping to enter or grow in the market is the quality of raw seaweed. Seaweed quality is generally determined by carrageenan yield, viscosity, and gel strength. These specifications are not significantly complex, but they can be difficult to control since they are affected by a range of environmental and human variables (e.g., water temperature and post-harvest handling). Quality is most accurately measured using laboratory tests of samples collected from seaweed farmers. Since these tests are costly in terms of time and resources, they are only conducted periodically by downstream buyers, such as seaweed exporters in Indonesia. Among intermediate buyers, including the network of local and regional traders that move seaweed from local farmers to national-scale exporters, quality is instead determined through approximation using two indicators: age of harvest and moisture content when dried. Seaweed quality increases as age of harvest increases (up to 45 day peak quality threshold), and moisture content decreases (through longer drying times). These two characteristics are easily monitored and field-tested through observation, albeit subject to error: the size and vigor of the seaweed thallus usually indicates age of harvest, while moisture content can be measured by touch and color. Therefore, these characteristics are used to codify the complex product specifications of carrageenan yield, viscosity, and gel strength into information that is easily communicated throughout the value chain.

Seaweed quality is a key consideration for carrageenan processors because it affects the yield and quality of manufactured products. Therefore, processors are willing to pay a premium for high quality seaweed, and may even completely refuse lower quality seaweed, depending on their markets. One Indonesian seaweed exporter collects raw dried seaweed from all over the archipelago and finds that some regions tend to produce higher qualities of seaweed while others produce lower. This exporter reported that carrageenan processing companies in the United States and Europe only accept higher quality seaweed, while their counterparts in China will accept lower quality. Meanwhile, at the sub-national level, processors can have different quality requirements, especially if they operate in distinct markets. For example, a cosmetics processor that uses carrageenan for lotions and similar products claimed to require higher quality seaweed, while a snack foods manufacturer that uses carrageenan for gummy candies (*dodol*) reportedly has less stringent quality requirements.

## 2.5 Upgrading Indonesia's position in seaweed value chain

In the global carrageenan industry, Indonesia plays an important role as a leading supplier of carrageenan-producing seaweed worldwide (i.e., *Eucheuma* spp, *Kappaphycus alvarezii*). Yet despite its abundance of raw seaweed material, the country's own capacity for carrageenan manufacturing remains marginal. As of 2012, only 18 factories in Indonesia were capable of processing carrageenan, and while this number has likely grown in the past several years, the industry continues to lag behind those in other countries (Mulyati 2015). In 2014, Indonesia exported approximately 5,000 tons of carrageenan, representing less than 3% of global exports (United Nations 2016).[7] The mismatch between the country's abundant seaweed supply and its lack of domestic carrageenan processing capacity is partly due to a poor investment climate in the late 1990s and early 2000s that discouraged Indonesian elites and transnational corporations from establishing processing operations (LEI Wageningen UR 2012; Wie 2012). Without an infusion of capital to construct prerequisite infrastructure, as well as a transfer of technology from existing foreign carrageenan manufacturers, the Indonesian seaweed processing sector lacked the jump start that it needed to enter and compete in the global carrageenan market. This situation has changed in the past decade as greater political and economic stability has attracted foreign and domestic investors to boost the seaweed sector, which has helped bring about an increase in Indonesian carrageenan exports by 275% (net weight) in 2012 from the previous year, bumping Indonesia from the 16th to the 9th largest exporter worldwide (United Nations 2016). Nevertheless, Indonesian reaps just US$ 39 million from carrageenan exports—just a

[7] Export data from UN Comtrade is for "mucilages and thickeners", which includes carrageenan as well as other products. Finer grained data exclusively for carrageenan is not available. An additional caveat is that exports do not capture the domestic carrageenan market in Indonesia. This data was unavailable at the time of this study.

fraction of the multibillion-dollar global carrageenan industry (United Nations 2016). Exporting carrageenan can generate over 9 times more revenue per tonne than exporting raw seaweed, based on export revenue data (United Nations 2016). Therefore, as long as Indonesia exports most of its seaweed in raw form, it is losing out on a major revenue source—making this situation especially pressing for its government to address. Thus, the Indonesian government's Blue Economy policies target carrageenan manufacturing as a high growth industry to upgrade its position in the global value chain.

The seaweed value chain—from cultivation to carrageenan manufacturing—is an ideal sector for development because it aligns with the three premises articulated in Indonesia's Blue Economy Model (KKP 2012). First, seaweed is an underutilized marine resource; Only 9% of the total area in Indonesia that could support seaweed aquaculture is currently under production, leaving vast potential for establishing coastal hubs (*minapolitan*) in underutilized and underdeveloped rural regions (Katadata 2016; KKP 2013).[8] Second, seaweed production is widely considered environmentally sustainable, as it requires no feed inputs, does not pollute local waters, and recycles nutrients in the marine ecosystem (Cai et al. 2013). Third, the low capital investment and technical skills required to cultivate seaweed makes it a simple and accessible source of income for impoverished rural communities. Indeed, the national strategy for seaweed cites these factors to explain how increasing exports of carrageenan and other value-added seaweed products will ultimately improve the welfare (*kesejahteraan*) of seaweed farmers

[8] The *minapolitan* is a coastal application of the *agripolitan* concept, which the Ministry of Agriculture used in the 1970s to leverage agricultural production to grow new cities and relieve pressure off urban centers (Wiadnya 2011). Under this framework, there is an emphasis on self-resilience, such that smaller cities or economic hubs should be able to support themselves by using their own resources efficiently and conservatively; in other words, the *minapolitan* must be sustainable, which aligns with the Blue Economy Model (Raissa et al. 2014).

and their communities (KKP 2015). Thus, seaweed meets the prerequisite ideological provisions of the Blue Economy Model.

*Policy strategies*

The Indonesian government has identified three primary mechanisms for developing the seaweed value chain, which are based on the broader value chain development strategies identified in the Blue Economy Model and the national Masterplan (MP3EI).

<u>Mechanism 1: Restricting raw seaweed exports</u>

One strategy is to restrict exports of raw dried seaweed to force a shift to value-added exports (i.e., carrageenan). A restriction was first put into place in 2012 and appeared to encourage more domestic processing, indicated by the aforementioned jump in carrageenan exports that year (LEI Wageningen UR 2012). However, President Joko Widodo's announcement of a complete ban on raw dried seaweed exports to be enacted by 2018 has sparked concerns among farmers that domestic processors would leverage the less competitive market to artificially suppress seaweed prices (Armenia 2015, Harrison-Dunn 2015).

These concerns are not unfounded. Similar outcomes have been seen in other industries when Indonesia tried to upgrade its place in the rattan and wood products value chains by restricting exports of raw materials. In 1988, a ban on unfinished rattan (a material used in furniture production) was put into place with pressure from elites in the furniture production industry in Java (Myers 2015). The ban led to a drop in domestic rattan prices by 30-50%, disadvantaging rattan collectors in the outlying islands (Godoy and Feaw 1989, cited in Myers 2015). After a brief period when the ban was lifted, it was again put into place in 2011. This time, rattan prices did not fluctuate as they did previously, but rattan collectors still struggled to meet buyers' specifications and repay loans borrowed from buyer-patrons. Meanwhile, furniture producers on outlying islands experienced significant losses, resulting in lower production levels, closures of many processing facilities, and job losses (Myers 2015). Similar outcomes were seen in the wood products industry when a ban on raw log exports was enacted in 1980, followed by a hiatus and then a second ban in 2001 (Myers 2015). Prices of raw logs in the domestic market were suppressed, encouraging illegal smuggling (Wie 2012). Low prices also contributed to the growth of the plywood industry and the concentration of jobs in industrial processing centers (Myers 2015). Although the rattan and timber industries differ from the seaweed industry in several ways, the common outcomes from these two bans—depressed prices and elite advantage—cannot be ignored as Indonesia looks to implementing a similar ban for raw seaweed.

Mechanism 2: Private sector and foreign investment

A second key strategy for the seaweed industry is to attract the private sector to invest in the domestic processing sector and help Indonesia upgrade its position in the value chain—a clear example of the state's neoliberal economic development approach outlined in the MP3EI. National and regional bureaucrats are explicitly encouraging foreign investors with tax incentives of up to 30% and duty-free provisions for importing processing equipment (Armenia 2015; Katadata 2016). These investment policies have the potential to buttress development of the seaweed industry, and it has been argued that increased foreign investment can support commercial aquaculture development (Hishamunda and Ridler 2006). However, foreign investment also poses a degree of risk, as they are often short-term and seek quick returns while skirting around local regulations (Hishamunda et al. 2009). Particularly in small-scale fisheries, including seaweed production, investment liberalization policies can lead to negative externalities on communities and environments if they occur in unsupportive conditions (Jacinto Jr. 2004).

Mechanism 3: Increased production in growth hubs

A third strategy being used for developing the seaweed value chain is increasing production; Indonesia hopes to boost seaweed production by 84% between 2015 to 2019 to reach 19.5 million tons (Katadata 2016). The state intends to focus this expansion in areas with underutilized coastal space and opportunities for parallel development of the processing sector, thus creating marine-based growth hubs (*minapolitan*) for upstream-downstream integration—a core part of the BEM and MP3EI (KKP 2013). This strategy was used in the East Sumba region within East Nusa Tenggara province, where directed investment through a *minapolitan* district led to a more than three-fold increase in seaweed production in just four years (KKP 2015). The state is directing investment in these growth hubs particularly toward rural areas of outlying islands, including West Nusa Tenggara province (Katadata 2016). Building growth hubs in less developed regions will likely alter the geographic distribution of seaweed production and carrageenan manufacturing capacity, which the Indonesian government hopes will lead to greater economic prosperity for impoverished coastal communities and rural provinces.

*Upgrading Lombok in national sector*

Lombok island in West Nusa Tenggara (NTB) province is included as one of the strategic centers in the national road map for seaweed development (KickNews 2016). Out of the over 30 *minapolitan* areas nationwide that are targeted for seaweed value chain development, five are located on Lombok (KKP 2013). Currently, Lombok makes a marginal contribution to Indonesia's seaweed production and carrageenan manufacturing. In 2014, Lombok farmers produced less than 3% of the total volume produced nationwide, and there are no processing facilities that turn Lombok seaweed into carrageenan (KKP 2014). Yet Lombok, and NTB province in general, are considered to have underutilized marine space with good oceanographic conditions for aquaculture. According to the head of the NTB Department of Fisheries, only 30% of the potential area for seaweed aquaculture was actively in use during 2015 (Kompas 2015). Thus, in Indonesia's Blue Economy Model, Lombok is a resource frontier, a place with ample resources for expansion and development of seaweed cultivation and processing.

Like the national government, NTB province has sought to upgrade in the seaweed value chain. Seaweed has been a regional development priority since 2009, but it received renewed enthusiasm from the provincial government in recent years as leaders have aimed to capitalize on the resources offered by the national government for developing the seaweed value chain (SPU-NTB 2016). Funding, technical expertise, media attention, and political support flows into the province through its ten *minapolitan* districts (half of which are in Lombok) as well as the National Seaweed Development Center located in Central Lombok. These resources are intended to maximize the 41,000 hectares of potential aquaculture area in NTB that have the capacity to produce 800,000 tonnes of seaweed per year (SPU-NTB 2016). The provincial government has also made efforts to develop seaweed processing capacity by partnering with the private sector to open carrageenan manufacturing facilities, though these have had limited success. Overall, NTB's adoption of a value chain development model for the seaweed industry allows it to strategically leverage its existing strengths and capitalize on recent attention from the central government to bring greater prosperity to its impoverished coastal communities and the entire region by upgrading its position in the seaweed value chain.

### 2.6 Conclusion

The global seaweed value chain is vast, with countries in all continents involved in some stage, from seaweed cultivation to carrageenan manufacturing to consumption. It is also quite lucrative, but much more so for the companies and countries involved further downstream in the value chain (i.e., carrageenan industry) than for those engaged further upstream (i.e., seaweed production). This difference is precisely what Indonesia's Blue Economy Model addresses; the national government is using policy mechanisms to increase investment in carrageenan processing capacity with the intention of upgrading Indonesia's position in the global value chain from being mostly a raw seaweed supplier to a carrageenan exporter. The Indonesian government also intends for its Blue Economy plans to uplift the seaweed farmers and impoverished coastal communities that support the most integral part of the value chain—seaweed production. In this national setting, Lombok island is one of the handful of sites chosen as a growth hub for the seaweed value chain, but it has a long way to go from currently producing a fraction of the country's seaweed to being a national leader in the industry. The subsequent chapters will discuss the current state of the Lombok seaweed industry and the constraints and opportunities facing Lombok farmers and the industry as a whole as they try to upgrade in the value chain, which holds implications for the prospects of Indonesia at large upgrading its position in the global value chain through its Blue Economy Model.

# Chapter 3: Seaweed Production Systems and Value Chain Dynamics on Lombok

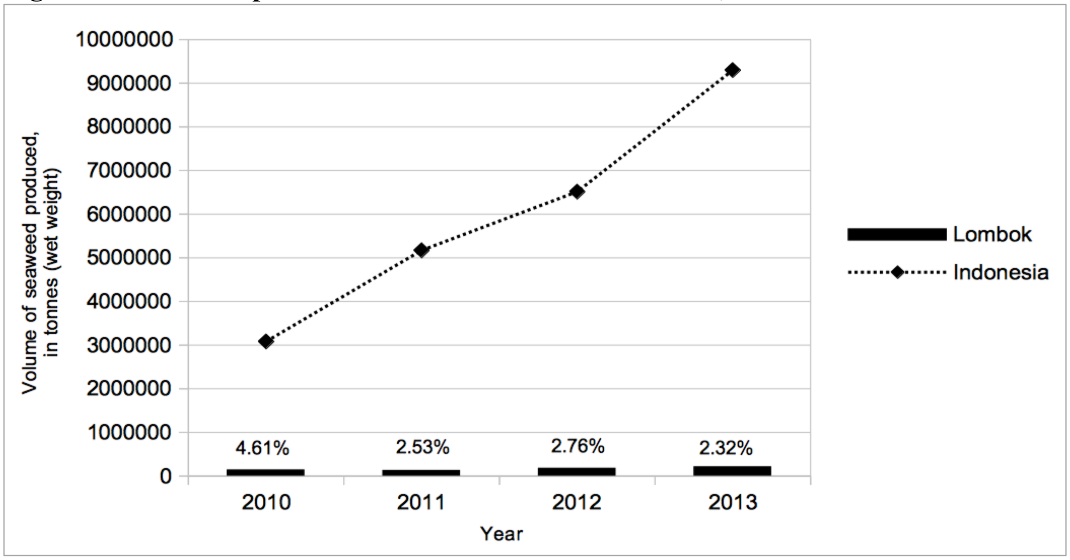
## 3.1 Introduction

The island of Lombok, West Nusa Tenggara province, has received increasing attention from the national government, the media, and investors for its reportedly vast potential to grow more seaweed and develop capacity to process that seaweed into carrageenan. As Indonesia's Blue Economy policies and corresponding provincial development plans unfold, the Lombok seaweed industry is set to undergo change, but whether seaweed farmers will benefit from this change hinges on the economic, social, political, and environmental factors that shape their participation in the value chain. This chapter aims to illuminate these institutional factors by examining the current state of the Lombok seaweed value chain. It first analyzes the social organization of production and collection at the three sites across Lombok and then examines the marketing channels and pricing system. This analysis brings to light the constraints and opportunities that face farmers and the industry as a whole as they try to upgrade in the value chain.

## 3.2 Seaweed and carrageenan industries on Lombok

As described in the preceding chapter, Lombok produces a small amount of seaweed relative to other islands nationwide. Although Lombok's total production volume has increased in recent years, so has production across the country, resulting in a decrease in Lombok's contribution to national seaweed production between 2010 and 2013, as Figure 3.1 depicts. Similar to other parts of Indonesia, Lombok produces mostly *Eucheuma* spp and *Kappaphycus alvarezii*, which are used for carrageenan manufacturing. According to traders, exporters, and carrageenan manufacturers, seaweed grown in Lombok is known to be poor quality in terms of

**Figure 3.1 Seaweed production in Lombok and Indonesia, 2010-2013**




*Sources: DKP-NTB (2013); KKP (2014)*

the parameters that are most important for carrageenan: viscosity, gel strength, and yield. Individuals in these positions explained that Lombok seaweed is often harvested earlier than the optimal time of 45 days, and that poor post-harvest handling practices frequently cause dirt, sand, and debris to be mixed in with dried seaweed. Research has corroborated these anecdotes, finding high levels of impurities and low gel strength in Lombok-grown seaweed (Darmawan et al. 2013; Dewi et al. 2012; Widyastuti 2010). Lombok's reputation for generating low-quality seaweed earns it a correspondingly low price in the national market relative to other areas that consistently produce higher quality seaweed, including the neighboring island of Sumbawa in West Nusa Tenggara province. A former seaweed collector who now conducts research on seaweed cultivation techniques at the University of Mataram, Lombok, explained this phenomenon:

> The market in Surabaya is very dynamic. In general, our [seaweed] production is dependent on the Surabaya market because the large bosses or collectors in the top positions send it [the seaweed] to Surabaya. Now there is a little problem here, truthfully. If I may, I'll go into it a little bit. Why can't our farmers control the price themselves? That is the problem. [A farmer might say,] "I want 10,000 IDR

> [per kilogram].” “You can’t. I want 6,000 IDR.” says Surabaya [buyer]. Why? Because you [the farmer] have seaweed that is bad. Seaweed production especially from Lombok is not controlled well. When it is harvested, the age when it is harvested is not controlled. It’s usually earlier. Second, how is the post-harvest processing? Where is it dried? Oh, maybe it is dried mixed with sand. That’s my experience. So the quality of your [Lombok farmer’s] seaweed isn’t good. So, okay, if the published price is 10,000 IDR/kg, for example. But especially for you, I [the collector] cannot give you that price because the quality of your seaweed is poor. (Karnan 2016)

Other stakeholders in the seaweed industry corroborated this, noting that this reputation has such a strong influence in the national market in Surabaya that even if an individual Lombok farmer grew higher quality seaweed, its Lombok origin would likely persuade the buyer to offer an unfairly low price.

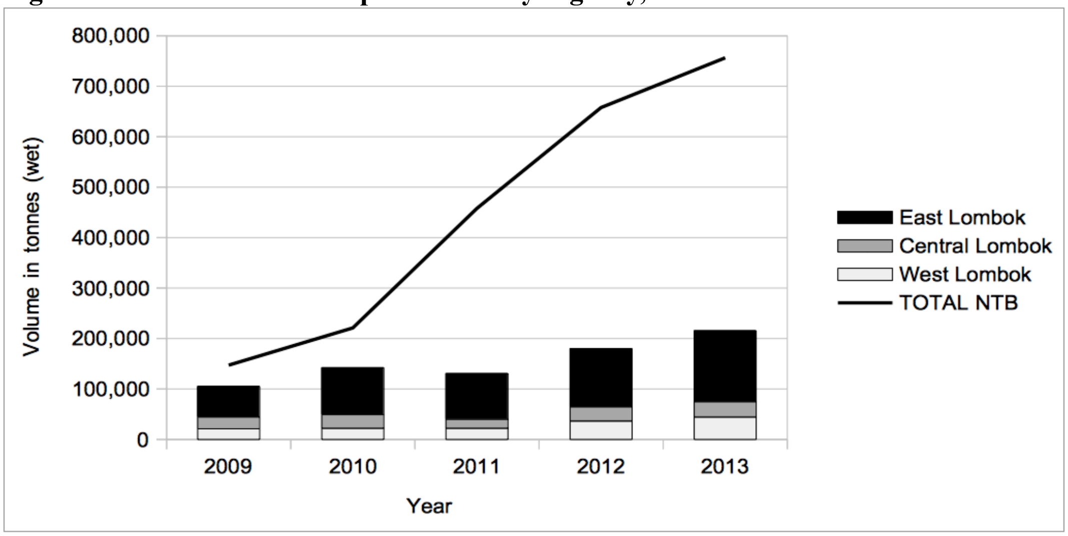
The low quality of Lombok seaweed has also proven to be a barrier to developing capacity for manufacturing carrageenan on the island. The single factory with this capacity, constructed in East Lombok by the provincial government, lies dormant after failed attempts to use Lombok seaweed to manufacture carrageenan. Thus, there are no carrageenan production facilities on Lombok currently in operation. Therefore, most of the seaweed from Lombok is shipped off the island to Surabaya, East Java, where it is either processed into carrageenan by domestic companies who mix it with higher quality seaweed, or exported to foreign manufacturers—specifically those in China, which is the main destination for low-grade seaweed exports, according to a well-respected seaweed exporter. In other words, while Lombok has sufficient volumes of seaweed to support a local carrageenan industry, the quality of its seaweed remains deficient to successfully manufacture carrageenan products.

### 3.3 Production systems across Lombok

As described in Chapter 1, seaweed is produced in three regencies on Lombok, listed in order of their annual production volumes (see Figure 3.2): East Lombok, Central Lombok, and

West Lombok. The production figures reflect the number of seaweed farmers in each regency: The data gathered from this study indicates that East Lombok has more farmers than the other two regencies, with possibly up to 4 times and 10 times as many as Central Lombok and West Lombok, respectively (see Table 3.1). However, the provincial government does not maintain a record of these numbers, so it is difficult to ascertain the precise populations.

**Figure 3.2 Lombok seaweed production by regency, 2009-2013**




*Source: DKP-NTB (2013)*

**Table 3.1 Population of seaweed farmers and local collectors in Lombok, by regency, 2016**

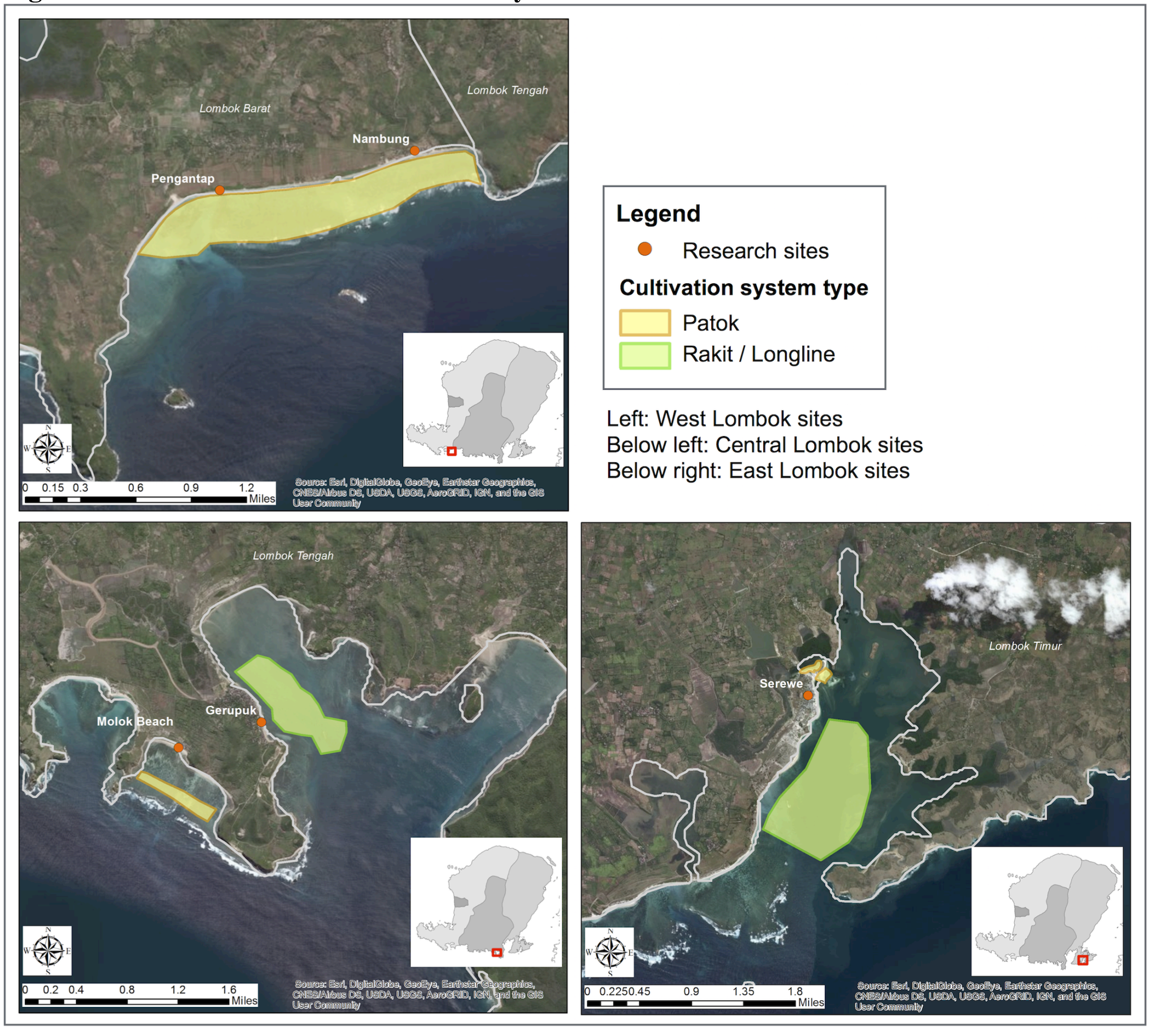
| Regency | # of Farmers | | # of Local Collectors |
|---|---|---|---|
| | Reported | Estimated | |
| West | 100 | - | 2 |
| Central | 240 | 264 | 6 |
| East | 280 | 1100 | 25 |
| Total | 620 | 1440 | 33 |

*Reported numbers of farmers and local collectors are based on sample data collected.*
*Estimated number of farmers is based on the average number of farmers in each local collector's coverage area (44).*
*Source: Data collected by author.*

### *Environmental conditions and seaweed quality*

Farmers use different cultivation systems to best suit the distinct oceanographic conditions in their respective area, also described in Chapter 1. Figure 3.3 depicts the

**Figure 3.3 Areas of seaweed cultivation by method at each research site**




*Source: Data collected by author.*

approximate areas where off-bottom, raft, and longline cultivation methods are used in the respective research sites. In West Lombok, the shallow and expansive Sepi Bay is only suitable for off-bottom systems, as are some smaller bays surrounding the village of Gerupuk, Central Lombok, and the furthest interior portions of Serewe Bay, East Lombok. In contrast, Serewe and Ekas Bays in East Lombok and Gerupuk Bay proper in Central Lombok are deeper and have more versatile coastlines that can support floating raft and longline systems. Production cycles also vary among the three research sites in response to different seasonal patterns. Sepi Bay, West Lombok, is more sheltered from the intense waves and winds that occur during the West

Monsoon season, and therefore farmers report being able to cultivate and harvest seaweed year-round, albeit with some periods of lower production volumes. In contrast, farms are more exposed at sites in East and Central Lombok, leaving farmers with no other choice but to halt cultivation for periods of time when the weather is too severe, or else they risk losing their crop.

Although seasonal variation is experienced differently across Lombok, farmers in all three sites demonstrated a high level of responsiveness to environmental conditions. Farms across Lombok vary in size. Farms using off-bottom cultivation systems range from 100-500 lines (10m in length) in smaller ones and 800-3,000 lines in larger farms. In comparison, small longline farms range from 200-300 lines (20m in length) and large ones range from 500-2,000 lines. In most large farms and even some smaller ones, farmers distribute their lines in two or more cultivation systems placed in different locations throughout the bay to protect against complete crop failure in case conditions are poor in an isolated area. If the oceanography of the site allows, farmers may also diversify their cultivation systems (e.g., half in a floating system and half in an off-bottom system). Many farmers using transportable systems (i.e., off-bottom or floating raft) will relocate their farm to a different location in the bay based on seasonal conditions. For example, in West Lombok, farmers move their off-bottom systems further offshore during the rainy season to avoid freshwater, low salinity, and *ice-ice* disease. Despite these strategies to reduce exposure to environmental threats, farmers cannot control ocean conditions entirely. Sometimes, farms do encounter unpredictably severe waves and wind, or sudden incidents of *ice-ice* or pests. These situations often cause farmers to immediately harvest their seaweed in order to prevent crop loss, even if it is earlier than the optimal 45-day growing period. Harvesting seaweed prematurely helps Lombok farmers maximize their return on investment and minimize capital losses, but it results in lower quality seaweed for carrageenan.

Thus, this practice has an unintended consequence of contributing to the poor reputation of Lombok-grown seaweed.

After harvest, Lombok farmers at the three study sites use similar post-harvest handling practices that tend to reduce the seaweed quality. As discussed in Chapter 2, seaweed must be dried after harvest, which is best done using a raised platform (*para para*) covered with a tarp to prevent sand, dirt, and debris from soiling the seaweed. A handful of drying platforms have been provided to each of the research sites by the local or provincial governments, in conjunction with trainings where farmers learn best practices for seaweed cultivation and post-harvest handling. However, Lombok farmers rarely use these platforms, instead choosing to dry seaweed on tarps or nets over the beach or fields, or on concrete slabs. Pareja (2016), a farmer in West Lombok, gave one reason for this practice—efficiency: "For drying [seaweed], there are platforms, but they are not enough so sometimes we use tarps. Especially once peak harvest season arrives. Sometimes we dry it here [on the pasturing fields]." Other farmers also reported a shortage of platforms to handle high volumes of seaweed, leading them to use substandard methods to quickly dry large batches of seaweed before it spoils, despite the greater likelihood of a reduced quality product. Thus, these post-harvest practices also contribute to Lombok's reputation for low-quality seaweed.

*Social organization of production and labor systems*

Seaweed farming communities on Lombok exhibit several social qualities that influence seaweed production systems and therefore warrant discussion. First, there is a strong respect for people in positions of superiority, including leaders, elders, and seaweed farmers who have been farming for the longest period of time. These superiors are frequently looked to for guidance and permission on matters affecting the community. Second, there is a strong adherence to norms and a tendency to avoid conflict. These qualities have bolstered the informal marine space management system, in which seaweed farmers claim an area without formal permits, but rather by using buoys to delineate farm territory on a first come, first served basis. Ahing (2016), a former seaweed farmer and current employee at the Seaweed Development Center in Gerupuk, Central Lombok, explained, “There isn’t a permit. The entire community owns the sea. Whoever wants to plant can plant…There isn’t conflict. Whoever sits in one place, that’s where he [his farm] is. Then, behind him there is nothing, so someone plants there. Here is one person, over there someone else, and over there another person. There aren’t clashes…People can help each other…” Other farmers corroborated that there is virtually no infringement of this system, but if there ever was conflict, community leaders would be consulted as arbiters. Third, there is an indication that value is placed on equitable outcomes and mutual benefits. For instance, a handful of farmers in East Lombok participated in a research study to test the impact of fertilizer on seaweed growth. The farmers dunked their seedlings into a bucket containing the liquid fertilizer before setting the lines into the seawater. According to the principal investigator, Karnan, the fertilizer improved their seaweed growth and reduced the occurrence of *ice-ice* disease. However, the control group of farmers whose farms were in the surrounding waters experienced an unusually poor harvest, which sparked tension in the community. Karnan (2016) recalled a conversation he had with one farmer, who told him, “I don't want to use it [the hormone] Pak, because it ruins the environment. When I had extraordinary harvest, [because] I used the hormone, [while] next to me [the neighboring farmer] didn’t have a harvest because he didn't use the hormone.” Karnan explained that the community members did not think the fertilizer necessarily improved seaweed growth, but rather believed the opposite—that it led to crop failure. The resulting conflict led community leaders and even local government officials to prohibit fertilizer from being used in seaweed production. In sum, social values, norms, and relations contribute to the organization of seaweed production in local communities across Lombok. They facilitate coordination among farmers and maintain a generally supportive social atmosphere. However, as the fertilizer story illustrates, these social qualities can sometimes introduce a barrier to individual advancement if it is seen to generate negative outcomes on other community members.

These social qualities have been conducive to more formal coordination among farmers in the form of groups with approximately ten farmers each. The impetus for farmers to organize is to become eligible to receive tools and supplies, such as the drying platforms, from government sources. In addition to sharing these provisions, group members collaborate to share labor for farming activities and compile their harvests for sale. Oftentimes, members also give a portion of their profits to a common fund that can be used to purchase seed or supplies in the case of widespread crop loss, seed shortage, or infrastructure damage. Despite these benefits, farmer groups tend to present challenging social dynamics, according to the farmers interviewed, so when the particular development program ends and the flow of government resources eventually dries up, farmers choose to return to farming independently. At the time of this study, nearly all of the farmers in West Lombok were in an active group due to a special assistance program funded in part by an international NGO. A smaller portion of Central Lombok farmers were in groups, with only 3 groups active at the time of this research. No farmers in East Lombok reported being in a group since there were no government-sponsored programs active at that time.

Independent farmers who do not belong to an organized group still rely frequently on neighbors and other community members to carry out their farming operations. Many farmers with both small and large farms hire day laborers to meet their labor demands, especially if there is a limited supply from their kin network (e.g., extended family, close friends, neighbors). Laborers are hired for different tasks and paid different rates accordingly. Workers hired to tie seedlings onto lines are paid on average USD 0.08-0.11 per line, resulting in approximately USD 7.50-11.25 of earnings per day. Workers hired to set lines in the cultivation infrastructure, harvest, pack the dried seaweed into sacks, and load the sacks onto trucks are usually paid a daily wage averaging USD 3.75-7.50. These roles, and thus pay grades, follow a gendered division of labor that is common across Lombok. Women are hired to tie seed onto lines, which occurs on shore, allowing them to quickly go back and forth between beach and home as needed to take care of household needs. Since women are responsible for child rearing, this role allows them to bring children along; indeed, children were often found sitting amongst women tying seedlings. Meanwhile, men are hired to work in offshore floating systems and do physically demanding onshore tasks, which is aligned with the expectation that they are away from home for a significant portion of the day earning sustenance for the household. Hired labor is virtually ubiquitous among farms in East Lombok regardless of farm size and cultivation system, but the practice is less common in Central Lombok and completely absent in West Lombok, where farmer groups prevail.

### 3.4 Access to capital and value chain governance

Hiring laborers is just one of the costs involved in seaweed farming operations. As Table 3.2 lists in the case of a floating longline system, farms incur both initial investment and annual costs, some of which are variable based on infrastructure and labor needs. To pay for these costs, Lombok farmers typically draw from multiple sources of capital. Among farmer groups, including those in West Lombok, the government is a source of capital in the form of supplies and tools. For independent farmers, their first choice is to use personal savings and loans from family, friends, or neighbors, which do not accrue interest and are repaid within 1-2 years. However, the most common source of capital used by independent farmers in Central and East Lombok are loans from local seaweed collectors. It is important to note that bank loans are not available to farmers due to the inconsistency of their income and thus their ability to make payments. In contrast, loans from local seaweed collectors have highly flexible repayment terms that allow farmers to make loan payments as they are able to without added interest, which has led almost all farmers to maintain debt with a local collector for years.

**Table 3.2 Averages costs for a 6-km seaweed farm using floating longline system**

| Item | Cost (USD) |
|---|---|
| INITIAL INVESTMENT | |
| *Cultivation system infrastructure* | |
| Polypropylene lines | 510 |
| Sandbag anchors | 45 |
| Plastic bottles as floats | 90 |
| *Equipment and facilities* | |
| 9-m canoe with 5.5 hp motor | 500 |
| Miscellaneous tools and equipment | 150 |
| Drying area (flakes, tarpaulin, or hanging) | 150 |
| Shelter for shade while working | 200 |
| Sacks | 16 |
| **Total initial investment** | **1661** |
| | |
| ANNUAL VARIABLE COSTS | |
| *Infrastructure, equipment, and supplies* | |
| Live cuttings as initial biomass | 192 |
| Fuel per boat | 14 |
| Maintenance per boat | 60 |
| Other farm maintenance | 60 |
| *Labor* | |
| Attaching cuttings onto lines | 1440 |
| Placing lines in sea | 960 |
| Removing lines | 960 |
| Drying crop | 960 |
| **Total annual variable costs** | **4646** |

*Adapted from Neish (2013). Costs calculated for a floating longline system with 6 kilometers of cultivation lines, harvested on a 45-day cycle with 8 annual cropping cycles, using data was gathered from farmers in South Sulawesi, September 2009. Initial investment costs refer to the capital needed to start begin running a seaweed farm, while annual costs are ongoing costs needed to run an existing farm.*
*Note: The scope of this study did not include a detailed lifetime cost assessment for each type of cultivation system used in Lombok. Thus, this table is intended to illustrate the typical types of materials needed for seaweed farming and the average costs that are typically incurred.*

While some farmers make a small payment each time they sell a harvest, most farmers only make a payment once or twice per year when they have a particularly large harvest, according to several local collectors. Until their debt is repaid, farmers must sell their seaweed exclusively to their local collector/lender, thus establishing a captive relationship according to global value chain governance theory. Haji (2016), a local collector in Central Lombok, described this relationship: "I give capital to 60 farmers, sometimes 500,000 IDR, up to 1 million IDR, depending on how many floating [cultivation] rafts they have…I only give them capital once…The farmers do not repay the capital. They sell to me again and again because there is a bond [*ikatan*]…If they want to sell to another collector, they have to repay their debt first…So it is a contract." Therefore, while the repayment flexibility enables farmers to survive periods of financial scarcity, such as during the rainy season or after a crop loss, the accompanying debt restricts farmers from participating in a competitive market. For local collectors, allowing farmers to maintain a debt carries financial risk, but they are willing to bear that risk in order to secure a stable supply of seaweed—a common issue throughout the industry. In fact, many collectors will give loans to farmers specifically to establish this bond (*ikatan*) and supply. As one local collector explained, "If there is not debt, she [the regional collector] is afraid we will sell to another place. That [the debt] is for the connection [*ikatan*]. If there is a connection, we aren't brave to sell to another place" (Saharudin 2016). The captive relationship between a Lombok farmer and local collector, while technically established through debt, is bolstered by social and political relations. Many collectors provide farmers with additional small loans to pay for household costs, which builds trust and creates clientelism in the relationship. Furthermore, collectors are held in high esteem by community members and are often referred to as "bosses." Their collection territory—which refers to the group of farmers with whom they have contractual relationships and is sometimes defined geographically—is widely known in the community and respected among other local collectors. Thus, in addition to the contractual basis of the captive relationship, these factors create a social-political grounds for a farmer to maintain this relationship rather than pursue other buyers that could offer a more competitive price. These factors also influence farmer groups who are not engaged in a captive relationship with a local collector, but choose to maintain a relationship with a single collector—a form of relational governance.

Captive relationships can also exist at the next node of the value chain if the capital that local collectors lend to farmers is originally borrowed from downstream buyers (i.e., regional collectors or processors). In these cases, the local collector must sell exclusively to the buyer who loaned the capital, thus offering a guaranteed supply of seaweed that is worth the risk buyers' incur by allowing collectors to maintain debt. This situation is ubiquitous in East Lombok, where a single regional collector has a contract with 25 local collectors from over 5 different villages. However, even when local collectors do not borrow funds from their buyer, they often maintain an exclusive relationship with a buyer for social and political reasons or out of convenience, since a consistent and trusted buyer is a valuable resource to a seaweed collector. These cases exhibit a relational form of value chain governance between local collector and the next downstream buyer. In either case of captive or relational governance, when local collectors commit to a single buyer, they effectively limit seaweed farmers' market participation.

### 3.5 Marketing channels and the pricing system

After seaweed leaves a farm in Lombok, it passes through the hands of two to three intermediate collectors before arriving at its last destination within Indonesia, which for the majority of Lombok seaweed is Surabaya. Even for the small portion of seaweed that remains in

Lombok, it still goes through these middlemen. Although there are myriad routes that the seaweed could take through this network of collectors, this study found that in many cases, the routes merge at the regional scale. In other words, the number of local collectors at a given site is not necessarily the best indicator of farmers' access to a competitive market. Instead, competition is better represented by calculating market concentration, or the degree to which a number of firms dominates an industry (Rutherford 2013). One commonly-used measure of market concentration is the Herfindahl-Hirschman Index (HHI), which is the sum of the squared market shares of individual firms in a given market (U.S. DOJ and FTC 1997). HHI is calculated using the formula:

$$HHI = \sum_{i=1}^{N} d_i^2$$

where $d_i$ represents the market share of the $i$-th firm and $N$ represents the total number of firms in the market (Krivka 2016). The HHI ranges from 0 to 10,000 points, with more points indicating greater market concentration and less competition. As Krivka (2016) notes, one drawback to the HHI as a measure of concentration is the challenge of knowing the market share of every enterprise engaged in an industry, but this issue did not arise in the case at hand because the number and respective market share of buyers was identified. The HHI was calculated for West, Central, and East Lombok markets at the scale of regional buyer, listed in Table 3.3.[9] A visual representation of market concentration is illustrated in Figure 3.4.

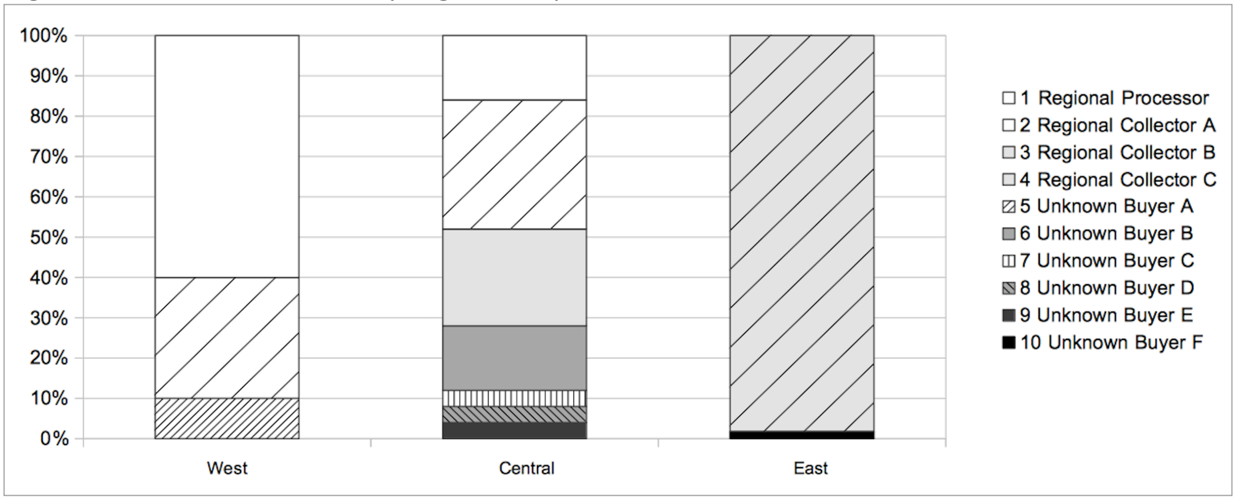
[9] Market concentration may vary when calculated at different nodes along a value chain. In this study, market concentration was calculated at the regional buyer node rather than the local buyer node because the regional scale offered a more meaningful analysis, given that local prices are based on regional prices—a phenomenon discussed later in this section.

**Table 3.3 Herfindahl-Hirschman Index (HHI) for West, Central, and East Lombok markets**

| Regional Market | HHI |
|---|---|
| West Lombok | 4600 |
| Central Lombok | 2344 |
| East Lombok | 9649 |

*Source: Data collected by author. HHI calculated according to U.S. DOJ and FTC (1997).*

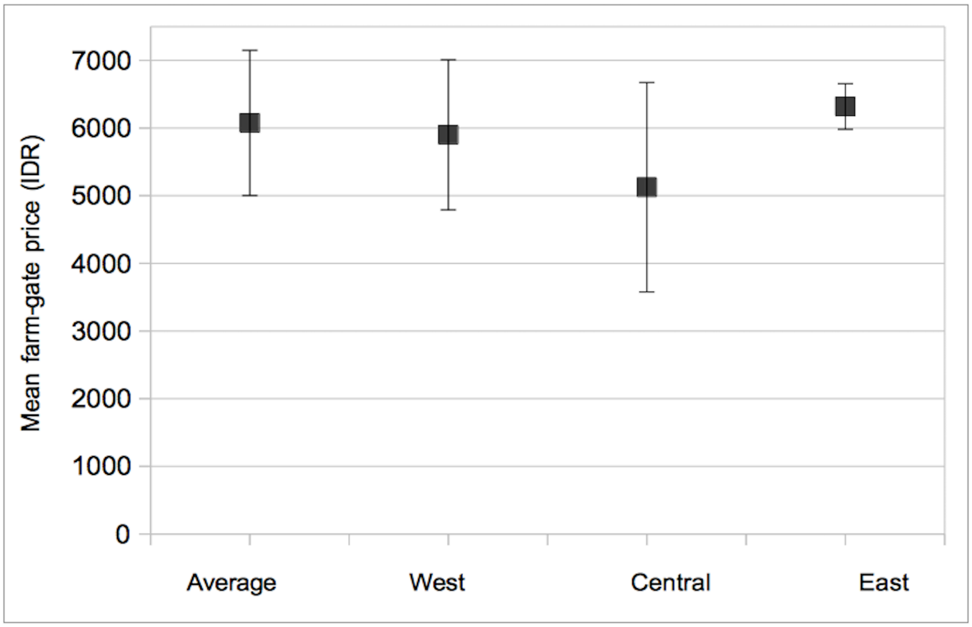
**Figure 3.4 Market share held by regional buyers in West, Central, and East Lombok**




*Source: Data collected by author.*

This analysis indicates that East Lombok has the highest degree of market concentration, with virtually all farmers selling to one of the 25 local collectors, who in turn all sell to a single regional collector. West Lombok exhibits slightly less concentration, with approximately 60% of farmers selling seaweed to a single local collector who exclusively sells to a snack food processing factory in Mataram. The remaining farmers sell to the only other local collector, who sells mostly to a single regional buyer, but sometimes sells to other unspecified buyers. Lastly, the lowest degree of market concentration is found in Central Lombok, where farmers sell to one of 6 local collectors who in turn sell to a broader range of regional buyers, which include the Mataram snack food processor. This study found that where local markets exhibited a higher degree of concentration, farm-gate prices were less competitive, which are shown in Figure 3.5. Therefore, although farmers in East and West Lombok are involved in more concentrated local markets, they earn more income per kilogram than their counterparts in the less concentrated market in Central Lombok.

**Figure 3.5 Average farm-gate prices on Lombok**




*Lines indicate one standard deviation from mean.*
*Source: Data collected by author.*

Value chain governance is one factor contributing to the degrees of market concentration observed in Lombok. Captive relationships in East Lombok between farmers, local collectors, and the single regional collector allows for a highly concentrated market. Even the handful of farmers who are not engaged in captive relationships frequently sell to these local collectors due to the ease of market access and the trust they have with the collectors. Likewise, West Lombok farmers consistently sell to the same local collectors in part because of the personal relationships they have formed with them. This relational governance, coupled with the challenges to market access posed by poor transportation and communications infrastructure, support a moderately high level of market concentration in this area. In Central Lombok, no single regional buyer has come to dominate the market, and there is relatively better transportation and communications infrastructure. However, value chain governance still inhibits farmers from being able to benefit from the more competitive local market. Captive and relational governance keeps many farmers in an exclusive relationship with local collectors. Even farmers who are debt-free can have trouble selling to a new buyer because of the strong hierarchical and territorial nature of the local collector network. As one local collector explained, “If another boss [buyer] comes [to Gerupuk], they have to go to Haji first. They cannot approach farmers. There is an order…The seaweed is sold from one party to the next to the next…from the first collector, to the second, then the third, and then it is exported. Haji is the first collector” (Ahing 2016). Because of these conditions, farmers in Central Lombok are not able to take advantage of a more competitive local market by jockeying different buyers and bargaining for higher prices. However, even if seaweed farmers across Lombok were able to participate in a more competitive market, they would face additional barriers to earning a higher price for their seaweed.

*Pricing in the Lombok value chain*

Farm-gate prices on Lombok are not only determined by market concentration and value chain governance, but they are also affected by the quality of Lombok seaweed as well as the pricing system. As mentioned earlier, seaweed prices in the national market are responsive to product quality, which is why Lombok’s reputation for producing poor quality seaweed earns it a consistently lower price than seaweed from other areas of Indonesia. However, this relationship changes further upstream in the value chain. At each intermediate step between national buyer and local farmer, the buying price is not determined by evaluating product quality, but rather by simply deducting a margin from the selling price. For example, if the exporter pays 9,000 IDR per kilogram, the regional collector might keep 1,000 IDR/kg for himself and pay 8,000 IDR/kg to each of his local collectors, who each might keep 750 IDR/kg and pay 7,250 IDR/kg to each of the seaweed farmers in his collection territory. The standard prices are given to all suppliers, regardless of the specific product quality offered by individuals. This pricing system is consistent across Lombok. Therefore, Lombok farmers cannot earn a higher price from local collectors by differentiating their product based on quality. Local collectors are not even in a position to offer a better price. Instead, in the current system, farmers can only receive a higher price if the downstream buyer—such as factory owner or exporter—offers a higher standard price, or if there are fewer middlemen so farmers receive a larger share of the profit. However, given the social and economic institutional barriers discussed above, these changes are unlikely to occur. Fuji (2016), a farmer in East Lombok whose profile was in Chapter 1, summed up farmers' perspectives on this system by saying, "That is only the place where there is disease [*penyakit*]—at the price. At that place, we feel discontent [*nggak puas*].

**3.6 Conclusion**

Although Lombok currently makes a modest contribution to Indonesia's seaweed production, the seaweed industry plays an important role in the regional economy. Seaweed farming is the centerpiece of many coastal communities as the primary livelihood activity for many households. The social values commonly held by the community members facilitates coordination and cooperation among farmers, and offers a degree of support for labor and capital needs. Additional support is offered to some farmers through government programs. Despite these resources, many farmers face limited access to capital, which leads them to establish captive relationships with local collectors. The social-political relations in these communities also promote exclusive trading relationships between farmers and collectors. In both cases of captive and relational governance, farmers are not able to participate competitively in the local market. However, local markets are not perfectly competitive due to barriers to market access, including instances of captive governance. Furthermore, no matter how much competition there is in local markets, the current pricing system in the Lombok value chain—from farmer to exporter—does not accurately correspond to quality differences across Lombok, let alone between individual farmers. Not only has Lombok's reputation for poor quality seaweed suppressed national, and ultimately, farm-gate prices, but the mechanism of standardized price setting precludes farmers from accessing higher prices with higher quality seaweed. As the next chapter will explore, these factors shaping Lombok production systems and farmers' participation in the value chain have implications for their ability to increase their income, as well as the ability of the provincial government to realize Blue Economy development goals of growing the carrageenan industry on Lombok.

# Chapter 4: Upgrading Trajectories in the Lombok Seaweed Value Chain

## 4.1 Introduction

The essence of Indonesia's Blue Economy plans for developing the seaweed value chain is to transition its national industry from seaweed production to carrageenan manufacturing; in other words, the country aspires to functionally upgrade in the global value chain. Lombok, and West Nusa Tenggara province more broadly, have similar hopes of functionally upgrading to become a supplier of carrageenan to the national market, but the region also seeks to upgrade its product by increasing the sheer volume of its seaweed production and improving its quality. Critical to achieving these goals are Lombok seaweed farmers, and while they have been provided training and supplies by government and NGO programs to help them improve their production and processing practices, the largest barriers they face have not been meaningfully addressed. This chapter uses the preceding chapter's analysis of social, economic, political, and environmental factors shaping value chain governance and farmers' market participation to examine the suite of upgrading trajectories available to Lombok seaweed farmers and to determine the constraints and opportunities they face. It then considers the Lombok seaweed industry as a whole to assess the upgrading possibilities of the region.

## 4.2 Upgrading trajectories for seaweed farmers

There are various ways that Lombok seaweed farmers could potentially upgrade in the value chain and thus earn a higher income to support their well-being. These are summarized in Figure 4.1 and described in more detail below.

**Figure 4.1 Upgrading trajectories for Lombok seaweed farmers**

| Upgrading type | Strategy | Lombok farmers do this? | Barriers |
|---|---|---|---|
| Product | Improve the quality of product by using best practices or more advanced technology for harvesting and post-harvest drying | No | Pricing system |
| | Add value to product by processing seaweed with partial alkali treatment | No | Pricing system |
| | | | Lack technology/skills |
| | | | Lack capital |
| | Produce higher volumes of seaweed | Yes | |
| Process | Use labor, time, and other resources more efficiently (e.g., hired labor, motor-powered boats) | Yes | |
| | Attain higher and more consistent crop yields through more efficient cultivation system, diversification and distribution of lines, etc. | Yes | |
| | Use technological strategies to improve crop yields (e.g., tissue culture seeds, fertilizer) | No | Lack capital |
| | | | Social-political conflict |
| | Coordinate with other farmers to secure more resources, increase bargaining power (e.g., farmer groups, cooperatives) | Sometimes | Limited government resources available to groups |
| Functional | Perform a collecting or coordinating role | Sometimes | Limited capital |
| | | | Limited social-political network |
| | Process seaweed into snack foods | Rare | High costs without profit guarantee |
| | | | Limited market access |

*Source: Produced by author.*

*Product upgrading*

Product upgrading is usually achieved by increasing the product's value, which farmers can do by improving seaweed quality by using more advanced technology and/or best practices for harvesting and post-harvest drying. Farmers can also add value to their product by processing their seaweed through a weak alkali treatment, which prepares the seaweed for carrageenan manufacturing. Another way is to cultivate a species or strain of seaweed that has a higher market value. Alternatively, product upgrading can be achieved by simply producing greater volumes of seaweed. The last two strategies are currently the only ones consistently used by Lombok seaweed farmers to upgrade their product. Many farmers reported cultivating two types of seaweed, usually a variation of *Kappaphycus alvarezii* and *Eucheuma spp*, but since the former is consistently priced USD 0.08 per kilogram higher than the latter, farmers prefer to cultivate *Kappaphycus* whenever possible. Crop losses and seed shortages are the main reasons why farmers may have to cultivate the lower value *Eucheuma spp*. Although most farmers have participated in government-sponsored trainings to learn best practices and some, as current or previous members of farmer groups, have received drying supplies (*para para*), farmers do not actively try to improve the quality of their product because their investment in time and potentially capital will not earn them a higher price from their local collector, due to the standard pricing system described in Chapter 3.[10] As for weak alkali treatment, the costs are far too high and the technology has not been made available to farmers on Lombok by carrageenan manufacturers. However, according to a seaweed-based cosmetics manufacturer based on Lombok, this technology has been provided to farmers elsewhere in return for a premium price for the partially processed seaweed.

*Process upgrading*

Process upgrading entails a greater efficiency in transforming inputs into outputs, which can be achieved in a variety of ways on a seaweed farm. One way is to make more efficient use of labor, time, and resources. Farmers can hire day laborers to make the entire production process go more quickly, so long as the investment in their wages can generate higher volumes of seaweed. Farmers can implement new tying techniques for more easily attaching and removing seedlings to lines and lines to cultivation infrastructure. Technology can also make economic use of time, such as using motor-powered boats to access offshore floating systems.

[10] It is worth noting that many upgrading decisions are ultimately based on whether investments pay off or not from the farmer's point of view. A baseline economic analysis of the costs and returns on investment for different upgrading strategies was outside the scope of this study, but based on farmers' behavior and interview responses, it was clear that certain upgrading strategies were not worth the investment. Nevertheless, a detailed baseline economic analysis of upgrading options would be a worthwhile topic for future research.

Another approach to process upgrading is through higher and more consistent crop yields. To this end, farmers can choose a more efficient cultivation system, such as floating long lines rather than floating rafts. They can diversify their cultivation systems and distribute their lines across two or more sites in different locations throughout the bay to prevent total crop failure if conditions are poor in only a portion of a bay, or move their farms seasonally to avoid areas more likely to experience poor conditions. Farmers can also use technological strategies, such as using seed from tissue culture (*kuljar*) that is reportedly not only more resilient to poor environmental conditions, but can even grow faster and more robustly in such conditions. Another technology that could be deployed is a liquid fertilizer and hormone (*pupuk organik cair*) to reduce incidence of disease and bio-fouling and increase growth and vigor.

Process upgrading also includes more efficient ways of securing resources and bringing seaweed to market, such as through farmer coordination. One form of coordination is farmer groups, which allow the members to secure government-sponsored tools, supplies, and training. Group membership also offers a safety net of supplies, seed, and labor in times of crisis, and the potential for more bargaining power by compiling their harvests for sale. A more formal form of coordination is farmer cooperatives, which offer similar benefits as farmer groups, but have the advantage of operating as a financial institution. Cooperatives are eligible to receive direct funding from the government and banks, which they can use to provide low-interest loans and investment opportunities to their members, thus offering a viable source of capital and an alternative to becoming indebted to a local collector. Cooperatives also offer more direct market access by purchasing seaweed from members and selling it in bulk to a downstream buyer rather than a local collector, thus circumventing middlemen and perhaps securing a higher price. Both forms of farmer coordination has the potential to offer greater access to capital, supplies, technology, and the market—resources that can lead to other types of upgrading in the value chain.

Lombok seaweed farmers are engaging in some, but not all, of these process upgrading strategies. Many farmers, especially in East Lombok, who have sufficient capital resources hire day laborers and invest in motors for their boats, steps that allow farmers to re-allocate some time and resources to produce more seaweed or engage in alternative livelihood activities. Farmers from across Lombok pursued more efficient cultivation systems, where oceanographic conditions allowed, and used diversification, distribution, and seasonal relocation techniques to stabilize and increase yields. Less common was the use of technological advancements. *Kuljar* seed is both expensive and in short supply. Farmer groups in Central Lombok are most likely to obtain *kuljar* seed due to their proximity and collaboration with the National Seaweed Center located there. A leader of one such group reported a shorter growing period with a high level of carrageenan content, which allowed the farmers to harvest more frequently, increasing their income. Fertilizer, while proven by University of Mataram researchers to be effective at increasing seaweed growth and disease resilience, is now strongly discouraged by provincial and local government officials after farmers in East Lombok who were used as the control group (i.e., seaweed was not treated with fertilizer) during field experiments experienced above average bio-fouling, *ice-ice* disease occurrence, and crop failure.

In terms of farmer coordination, there are no farmer cooperatives currently in operation on Lombok, but there is one that is reportedly in the process of being formed in Central Lombok. There are at least a dozen farmer groups in West and Central Lombok, as described in the previous chapter. While the members of these groups gain access to supplies and other resources from the government, which they otherwise would not be eligible to receive, their coordination does not necessarily lead to higher seaweed prices or better market access. In fact, the average farm-gate price in West Lombok, where all farmers are members of groups, was less than in East Lombok, where no active farmer groups were reported. In addition, the West Lombok farmer groups only have access to the market via relationships with the two local collectors, which exhibit a strong degree of relational governance. This, coupled with poor transportation and communication infrastructure, counteracts the power gained through farmer coordination.

*Functional upgrading*

There are several functional upgrading trajectories for seaweed farmers. Farmers can add a function by becoming a local collector. Alternatively, if they have connections to downstream buyers, farmers can instead play a coordinating role by organizing larger shipments of seaweed with local collectors, thereby gaining access to larger markets without taking on the financial burden that collectors often have since their suppliers maintain debt for long periods of time. Farmers can also add a function as a processor, using their own seaweed and purchasing more from other farmers or local collectors to manufacture snack foods. This upgrading path requires more investment, access to technology, knowledge, and skills, as well as access to markets to sell the goods. The entry costs are even higher for manufacturing carrageenan, virtually eliminating it from the upgrading trajectories available to seaweed farmers.

Few Lombok seaweed farmers engage in functional upgrading. Most farmers do not have the financial resources or connections to downstream buyers required to be a local collector. Furthermore, although some farmers aspire to become a collector to earn a higher income, others do not wish to take on the associated financial risk and social burden of being the sole buyer for a number of suppliers. A former collector explained this perspective:

> Truthfully, the collector is not too wealthy. Even though he is the one guiding [the trading relationship with the farmer], it [seaweed production] is very dependent on the season. So [for example], the farmer borrows 1 million IDR. If the farmer has a crop failure, the collector also loses out because the farmer cannot repay the loan. Not everyone in the community is interested in becoming a collector. (Karnan 2016)

Only one farmer in the sample, located in East Lombok, played a coordinating role, and his ability to do so appeared dependent on his unique combination of capital and social network. Some farmers—particularly women—or the wives of seaweed farmers functionally upgrade to manufacture snack foods, which they were able to do after receiving training and supplies from government programs. However, this upgrading does not necessarily result in a better livelihood. Many processors experience difficulties bringing their product to market efficiently and finding a consistent buyer. Fluctuations in exchange conditions sometimes makes the prices of other ingredients prohibitive, such as flour for seaweed chips, and some processors reported temporary halts in production due to broken tools and machines.

Thus, functional upgrading is not a common trajectory among Lombok farmers due to the high investment costs, high risk, and low guarantee of a higher income.

### 4.3 Key factors influencing upgrading opportunities for farmers

These upgrading trajectories are influenced by a host of factors both internal and external to the value chain, but two key factors emerge from this analysis: exchange conditions and governance, the latter of which is mostly a function of access to capital and social-political relations. These are the main constraints Lombok farmers face in realizing their entitlement and improving their well-being through participation in the seaweed value chain.

*Exchange conditions*

Exchange conditions is the dominant factor influencing product upgrading and, albeit to a lesser extent, functional upgrading opportunities for farmers. In particular, in the current pricing system, farm-gate prices are unresponsive to seaweed quality and therefore inhibit product upgrading regardless of the form of governance. Functional upgrading, specifically becoming a processor of seaweed-based products, is limited by exchange conditions, as costs of ingredients can often be too expensive relative to the value of the products. Furthermore, many small-scale processors often face challenges bringing their products to market.

*Governance*

Value chain governance type influences opportunities for process and functional upgrading, but does not have as much impact on product upgrading. The type of governance appears to be mostly determined by access to capital. The lack of banking and crediting services available to seaweed farmers leads most farmers to borrow loans from local collectors and thus engage in a captive relationship. However, in the presence of government programs that offer capital in the form of supplies and training to farming communities, farmers can form groups to leverage those resources and avoid becoming indebted to local collectors, thus creating relational forms of governance.

Captive governance enables some forms of process upgrading, but limits opportunities for product upgrading and does not support functional upgrading. Several interdependent factors produce these outcomes. Farmers' limited access to capital leads to the establishment of captive relationships and their persistent indebtedness prevents them from ending the relationship and seeking out other functional roles, or joining a farmer group. Meanwhile, the prevailing seaweed pricing system creates unfair exchange conditions such that a higher value seaweed does not earn a higher price in the local market, and any power farmers might have to seek out a more competitive price is lost when they enter captive relationships. Under these conditions, farmers cannot justify the investment to upgrade their product quality because it will not result in a higher income.

In cases of relational governance, there are more possibilities for upgrading. Process upgrading remains a common strategy for farmers, and the lack of captive relationships makes farmer coordination more feasible. Coordination offers more access to resources—such as better drying tools and advanced *kuljar* seeds—that can pave the way for more process and even product upgrading. However, farmers in these situations still face disadvantageous exchange conditions in which they are not rewarded for producing higher value seaweed. Therefore, farmers' realistic options for process and product upgrading remains limited in cases of relational governance. Functional upgrading, however, is possible, and in fact the farmers in the study who play a collecting or coordinating role had previously engaged in relational governance situations but never captive ones.

There are few isolated instances of market governance in the Lombok value chain, only one of which could be identified at the farmer level. This individual farmer benefits from his fairly unique combination of personal capital, knowledge, skills, and political-social network, all of which allow him to engage in functional upgrading by playing a coordinating role and process upgrading by using more efficient tools, cultivation systems, boat transportation, and hired labor. His opportunities in product upgrading, however, remain limited to increasing the volume of seaweed production because prices—even those from downstream buyers—are unresponsive to the quality of his product and reflect the overall poor quality of Lombok seaweed.

## 4.4 Upgrading the Lombok seaweed industry

As the West Nusa Tenggara government aims to upgrade Lombok's position in the national seaweed value chain, there are several trajectories it could take. However, the upgrading prospects for the Lombok seaweed industry is coupled with the ability of Lombok seaweed farmers themselves to upgrade in the value chain, resulting in similar challenges at the regional scale.

*Product upgrading*

Lombok seaweed has a proven reputation for being low quality. The steps to improve product quality are clear—harvest seaweed after the optimal growth period and dry the seaweed using platforms or racks covered with tarps to protect it from dirt and sand. Provincial and local governments have and continue to hold training workshops on best practices and provide drying tools and farming supplies. These development interventions are premised on a commonly held perception among government employees, researchers, and seaweed collectors that the root of the quality problem is the behavior of seaweed farmers. One regional collector on Lombok explained that the difference in quality between Lombok and neighboring Sumbawa, where the price for seaweed can be USD 0.15-0.22 more per kilogram, is "because they [farmers in Sumbawa] are people who want to work hard…their harvest is good, after 45 days. Here [in Lombok] it is only one month" (Patima 2016). However, after years of trainings to improve farming practices, the problem has not been resolved. As discussed above, farmers do not take measures to improve their individual seaweed quality because they would not receive a commensurate increase in income given the current pricing system. Furthermore, when local collectors were asked whether the price given to farmers would change if they produced a higher quality seaweed, most reported no, because the price reflects what they receive from the regional buyer.

*Process upgrading*

Lombok could engage in process upgrading by introducing more efficiency in the value chain. One strategy to achieve this goal is to connect farmers directly to downstream buyers so seaweed passes through fewer nodes between farmer and factory, nodes that do not add value to the product but incur costs. This strategy is supported by a veteran in the industry and employee at an international carrageenan manufacturer, who believes, “Shortening the supply chain is the way we should go. You try to remove as many people in the supply chain who are just traders, who don't add anything, because these people don't care about the processors and they don't care about the farmers. They are just trying to make a profit.” (Anonymous 2016). Such inefficiencies have been ameliorated in other supply chains through similar forms of contract farming (Setboonsarng and Leung 2014). However, this strategy suggests that local and even regional collectors would be cut out of the value chain—a politically charged suggestion given the strong social-political relations in which the value chain is embedded. Indeed, in the presentation of this study’s preliminary results, local researchers questioned what would happen to collectors’ livelihoods if farmers were to sell directly to factories. Another strategy to improve efficiency in the Lombok value chain is to improve farmers’ access to capital. This strategy involves both creating sources of capital, such as micro-lending programs, and assisting in farmer coordinating efforts. The provincial government is taking initial steps to help farmers in Central Lombok organize into cooperatives, which would increase their access to capital and potentially enable them to circumvent middlemen in the value chain.

*Functional upgrading*

The main focus of the provincial government is to functionally upgrade Lombok's position to become a carrageenan manufacturing region. Successfully upgrading requires a host of strategies, including private and public sector investment, technology transfer, infrastructure development, factory construction, and workforce development. The government has successfully constructed a factory for semi-refined carrageenan in East Lombok, but the factory cannot operate because, according to researchers, the Lombok seaweed it tried to use as raw material was too poor of quality. Provincial government officials have also attracted a business to invest in a joint-venture project for carrageenan manufacturing, but the factory was built in the neighboring island of Sumbawa that is known for producing higher quality seaweed. Although there is another factory with the same private investor that *is* located on Lombok, it produces seaweed-based cosmetics rather than carrageenan and it does not source its seaweed from Lombok, but rather ships in a higher quality seaweed from other areas. The company's manager explained that the quality issue is a deterrent, despite the abundance of seaweed produced in Lombok:

> You know, we have a partnership with Lombok and we know that Lombok can have a lot of seaweed from Lombok Timur from Serewe, etc., but they don't handle post-harvesting in a good way. They put [the seaweed] in the sand to dry so the seaweed becomes very dirty, very smelly. As I mentioned before, seaweed in Indonesia has a poor quality than seaweed in Philippines or Malaysia. (Nurfauzi 2016)

*Key factors influencing upgrading in Lombok*

Lombok is readily prepared to upgrade in the seaweed value chain with a supportive provincial and national government, interested investors, labor supply, and ample space for both seaweed production and carrageenan manufacturing. The area has been unable to realize its hopes of upgrading—particularly product and functional trajectories—primarily due to an inadequate local supply of high quality raw material. This barrier is widely recognized by government officials, researchers, and value chain stakeholders alike, and the government has been taking efforts to overcome this hurdle, but its efforts have been targeting only one facet of the problem. Trainings and supplies help prepare farmers to produce high quality seaweed, but they will only use those best practices, which require more time, if they are appropriately compensated for a higher value product, which currently they are not. Therefore, the pricing system appears to be the core of the quality problem that remains unaddressed. Although the government could circumvent this challenge if carrageenan manufacturers ship in seaweed from other regions, like what the cosmetics manufacturer is doing, but its own farmers will remain shut off from that market and the inclusive opportunities promised by the value chain development plans will not be realized.

**4.5 Conclusion**

Value chain upgrading can be beneficial to individuals and regions alike as it generally offers opportunities to increase income and improve well-being. These potential benefits underlie the West Nusa Tenggara government's plans, in association with the national Blue Economy development plans, to functionally upgrade the Lombok seaweed value chain by manufacturing carrageenan. In recognition of the persistent issue of poor quality seaweed grown on Lombok, the government has made attempts at helping farmers to improve the quality of their seaweed (i.e., product upgrading), but to little avail because the standardized seaweed pricing system discourages farmers from actually employing best practices. One strategy to overcome this barrier is through farmer coordination, but so far, organized farmer groups in Lombok face limited market access and still receive standard prices. Farmer cooperatives might offer more opportunities to successfully earn a higher price for a higher value product by increasing access to capital, reducing the number of middlemen, and avoiding captive relationships, but they have not yet been established in Lombok and would likely require significant public sector support to realize those opportunities. Ultimately, the constraints on farmers' upgrading possibilities in turn limit the upgrading possibilities of Lombok's industry as a whole. Different strategies must be taken by the government to dismantle the barriers preventing farmers from improving their position in the value chain and increasing their income in order for the region to upgrade itself.

# Chapter 5: Conclusion

## 5.1 Introduction

The desire for improving one's economic position to more easily meet one's basic needs, live more comfortably, and enjoy a better quality of life is an arguably universal desire. Nations, too, share in this desire, and leaders' will to improve has driven economic development around the world. As countries' have become increasingly integrated in the global economy, they have sought to develop by upgrading their positions in global value chains. The classic trajectory many countries take is from exporter of raw materials to manufacturer of value-added products, a process that is expected to generate trickle-down benefits to all participants in the value chain—smallholder producers, traders, and processors alike. However, as this study has illustrated, economic, social, and political factors inhibit such upgrading trajectories, making it difficult for improvements to be realized. Furthermore, barriers facing individuals at local scales may not be immediately apparent at the regional or national scale, but nevertheless they can constrain upgrading at those broader scales. Despite the importance of these factors, they are often overlooked in national development plans that use value chain upgrading as a foundation for broader economic development, such as Indonesia's Blue Economy Model.  Such policies assume that economic liberalization strategies at the national scale will suffice to achieve upgrading goals without taking additional measures to address the particular challenges at regional and local scales. This study challenges this underlying assumption of value chain development by bringing to light the complex, interdependent factors shaping upgrading possibilities for Lombok seaweed farmers and the Lombok industry as a whole within Indonesia's value chain development plans.

## 5.2 Key findings

This study examined the social organization of local seaweed production and trade across Lombok, including farmer-buyer relationships and distribution of benefits. It analyzed seaweed farmers' access to capital, market, technology, and other resources, as well as social-political, economic, and environmental factors, to characterize the power relations in terms of value chain governance. This study found that class is the dominant type of power relations, as access to capital determines the type of relationship between farmers and local collectors, most of which exhibit either captive or relational governance. Similar relationships are found at the next node, between local collectors and downstream buyers, with market governance becoming more common. The presence of multiple forms of governance among and within nodes demonstrates that the Lombok seaweed value chain does not exhibit a uniform governance type. Governance affects farmers' access to market; captive and relational forms of governance usually offer only a single marketing channel to farmers, in turn reducing the likelihood that farmers' will receive a competitive price for their seaweed. Governance also influences farmers' upgrading possibilities, with captive and to a lesser extent relational governance limiting opportunities for product, process, and functional upgrading. In spite of these constraints and power asymmetry, captive and relational forms of governance between farmers and collectors does offer advantages by providing a more stable income, closer business ties, and for the farmers in this case study, higher prices.

In terms of upgrading activities, many Lombok seaweed farmers engage in process upgrading by increasing efficiency of seaweed production and, among a smaller number of farmers, by becoming a member of a farmer group. Less common is product upgrading, which is only achieved by increasing total production volumes rather than quality improvements.

Likewise, farmers generally do not engage in functional upgrading. The primary factor affecting upgrading practices is exchange conditions in which higher value products do not earn corresponding prices. Additional challenges include governance type, access to capital and market, and social-political relations. Farmers' decisions to not upgrade in these conditions reveal the risks and rewards involved in upgrading and the calculation farmers must make to determine if doing so will ultimately improve their outcomes.

### 5.3 Potential paths forward

This study has shown how the constraints on upgrading trajectories for seaweed farmers have in turn become constraints for the Lombok industry at large. It has also provided evidence suggesting the existing upgrading strategies taken by the provincial and national governments have thus far been ineffective at achieving their expressed goals, and that new or additional objectives and strategies must be adopted. One such objective should be to ensure that seaweed prices accurately reflect product value (i.e., seaweed quality) so that if farmers invest in product upgrading, they are rewarded with a higher price, a recommendation that has been made for seaweed value chains elsewhere (see Jacinto Jr. 2004; Krishnan and Narayanakumar 2010). This goal is especially elusive because of the current pricing system, in which farm-gate prices are relative to the price for Lombok-sourced seaweed in the national market, which is consistently lower due to Lombok's reputation for poor quality seaweed. Therefore, exporters and other downstream buyers must trust the quality of a particular source Lombok seaweed if they are going to offer a higher price—a tall order given the tiered structure of the seaweed collection system in Indonesia. One strategy to overcome this challenge is encourage more direct connections between farmers and downstream buyers, which would increase seaweed traceability, pricing transparency, and upward and downward accountability. The market in East

Lombok resembles a step toward this direction. Although there are two intermediate collectors between farmers in Serewe and the exporter, the captive relationships between the nodes creates a moderate degree of traceability and accountability. These conditions allow the exporter to regularly test the quality of the seaweed and adjust the price accordingly, albeit it on a macro-scale so all of East Lombok is evaluated for an average quality and given a standard price. This evaluation could be made on a finer scale of farmer groups/cooperatives or even individual farmers if farmers were more directly connected to downstream buyers.

Reducing the number intermediate nodes would further increase accountability, so if buyers invested in helping farmers improve their seaweed quality, those buyers would be assured that they would have a higher quality supply. This type of direct collaboration has had promising results elsewhere in Indonesia. In a partnership between Ocean Fresh, a cosmetics and semi-refined carrageenan manufacturer, and farmer cooperatives in East Java, Ocean Fresh provided training and tools for farmers to apply a weak alkali treatment to their seaweed, and for farmers that used the treatment, the company offered prices that were 6 times higher than regularly dried seaweed (Nurfauzi 2016). Another strategy to engender more direct connections between farmers and processors is to enact regulations that require Lombok processors to use Lombok-grown seaweed. This approach was taken in the neighboring island of Sumbawa and has proven successful in promoting reinvestment in local capacities and more accountability between suppliers and buyers.

Another objective for provincial and national governments to consider is to increase farmers' access to capital so they have more options aside from personal savings, loans from family/neighbors, and loans from local collectors. One approach that is being explored by students at the University of Mataram on Lombok is micro-lending programs administered by

NGOs, banks, or even the government. These programs have the potential to offer farmers the capital they need while also having more flexible terms than standard bank loans, which is important for seaweed farmers whose harvests and incomes are subject to environmental variability. A complementary strategy to increase access to capital is by fostering farmer coordination. Farmer groups have provided a moderate degree of support though the provisioning of supplies and tools, but they do not give farmers direct access to capital. In contrast, farmer cooperatives offer members lending services and investment opportunities, as well as alternative marketing channels. These recommendations have been made by other studies of Indonesia's seaweed value chain, such as Neish (2007), who argues for greater farmer coordination and access to banking and credit services as critical steps toward empowering farmers and creating upgrading opportunities.

These strategies have the potential to generate multiple positive effects throughout the value chain. They can create more opportunities for farmers to upgrade and ensure they receive benefits commensurate to their investments. Meanwhile, they can help increase the quality of Lombok seaweed so it can support a local carrageenan manufacturing industry and change its national reputation to earn a higher price that reflects the product's true value. In addition, increasing farmers' access to capital can in turn increase their ability to participate more competitively in the market. Collectively, these strategies address institutional barriers to upgrading throughout the value chain—from farmers to Lombok's industry to the national industry—and thus represent examples of the complementary measures to liberalization policies that Ravenhill (2014) argues are integral to realizing value chain development goals like those in Indonesia's Blue Economy Model.

### 5.4 Theoretical contributions

In addition to its empirical contribution, this study has also made contributions to theoretical debates about global value chain governance and upgrading. The study's findings substantiate Bolwig et al. (2010) and others' arguments for incorporating social, political, economic, and cultural factors, as well as "external" actors, into value chain analysis, as they proved to strongly influence governance and upgrading opportunities. To this end, this study demonstrates the utility of leveraging a theory of access, and in doing so contributes to the growing body of work that applies this theory to GVCs. In addition, this study has shown how Sen's (1999) concept of entitlement can complement access analysis to explain how control over resources does not necessarily guarantee benefits. This study also illustrates variation in value chain governance and upgrading among and within nodes, corroborating the conclusions made by Jespersen et al. (2014) and providing evidence in support of future sub-chain inquiries. Lastly, it affirms the finding by Riisgaard et al. (2010) that the risks incurred through upgrading may not be worth the rewards for value chain participants. Given these outcomes, this thesis argues for testing this theoretical framework to analyze other global value chains, especially in settings where development policies are aiming to upgrade national industries that are founded on smallholder producers.

### 5.5 Future research

This study offers a humble step toward better understanding seaweed value chains in Indonesia, but there is much more to learn, especially as further steps are taken to carry out value chain development plans. At the local scale on Lombok, there will be several issues to examine. First, as farmer cooperatives begin to form, it will be important to assess the distributional outcomes offered by this type of market coordination, both within and across nodes in the value chain. Research should ask whether cooperatives result in more access to credit, access to market, and higher prices for farmers. It will also be worthwhile to observe whether cooperatives are long-lasting or more temporal, like farmer groups, which speaks to a broader concern about the sustainability of changes being introduced through development policies. A second important issue for future research to consider are changes in labor markets as a result of value chain upgrading. The establishment of seaweed processing facilities in rural areas like Lombok will create new demands for labor, offering an alternative source of income for seaweed-farming households. However, this process can reduce the labor pool for farming activities, bearing implications for the organization of labor in seaweed production systems. A third topic worthy of further research is the impact of intensifying seaweed production, which is a core goal of Indonesia's Blue Economy Model. This study found that coastal management systems in Lombok are currently effective at managing marine space among existing coastal users. However, increasing farm density and expansion of production into previously un-farmed areas would likely introduce more competition for both ecological and capital resources, increasing the chance of social tension and conflict, as well as displacement through accumulation and dispossession—a process that has been observed in shrimp aquaculture development in Indonesia (Fougères 2008).

Widening the lens to the national scale, this study offers a starting point to consider variation in other seaweed value chains across Indonesia. Considering the variation observed among the three sites on Lombok, it is worth inquiring how this case compares to value chains on the island of Sulawesi and in East Nusa Tenggara province—two areas that, like Lombok, are targeted for development in Blue Economy plans—especially in terms of social, political, economic, and environmental factors shaping value chain governance and farmers' upgrading opportunities. Another productive line of inquiry would shift the focus of analysis to downstream actors, specifically domestic carrageenan manufacturers and exporters, to shed light on the governance of these nodes and the constraints and opportunities these actors face to upgrade amidst Blue Economy policies.

Scaling up again to the international scale, it would be fruitful to compare the case of Indonesia's seaweed value chain to value chains elsewhere that serve the same markets. Which regions of the world are serving the Chinese carrageenan market, like Lombok, and which are serving higher-end markets in Europe and the United States? In addition, an analysis of development policies in other countries with similar aims as Indonesia's Blue Economy Model and the constraints and opportunities facing their seaweed farmers could illuminate common themes occurring globally and encourage an exchange of lessons and strategies. These themes would be especially valuable given that two regulatory institutions may instigate changes in the global seaweed value chain. First, an international standard for sustainable production and processing of seaweed is currently being developed through a partnership between the Marine Stewardship Council and Aquaculture Stewardship Council. The standard would represent a new specification of product quality that would have to be communicated to and met by suppliers, thus potentially altering value chain governance at various nodes (Raynolds 2004). Second, the United States' National Organic Standards Board decided in 2016 to no longer allow carrageenan to be used as an ingredient in organic foods under the U.S. Department of Agriculture's certification system (Siegner 2016). This decision has raised concerns among stakeholders in the seaweed industry about the implications for seaweed-producing communities in Indonesia (Glienmourinsie 2016). These two regulatory changes demonstrate the importance of understanding the linkages between Indonesia and the global market in order to anticipate how macro-scale shifts can generate ripple effects up the value chain to the local scale.

Future research on these topics would add nuance and richness to the current state of knowledge of Lombok seaweed production systems and, more broadly, the Indonesian seaweed value chain. By generating a deeper understanding of how economic, social, political, and environmental factors function interdependently and across multiple scales to affect actors' participation in the value chain—from farmers to traders to carrageenan manufacturers, future studies have the potential to improve local and national development policies to better achieve their goals. Furthermore, as Indonesia's policies unfold, the dynamic nature of politics, markets, and environmental conditions will surely cause some factors to become more influential, while others become less pertinent. This temporality calls for a sustained effort to observe and understand the nature of seaweed production systems and value chains as these changes transpire.

# Bibliography

Adhuri, Dedi Supriadi, Laksmi Rachmawati, Hirmen Sofyanto, and Natasha Hamilton-Hart. 2015. "Green Market for Small People: Markets and Opportunities for Upgrading in Small-Scale Fisheries in Indonesia." *Marine Policy* 63. Elsevier: 1–8.

Ahing. 2016. "Personal Interview."

Anonymous. 2016. "Personal Interview."

Arfani, Riza Noer, and Poppy Sulistyaning Winanti. 2014. "Value Chain Governance in Export Commodities: The Case of Indonesia." In *Connecting to Global Markets Challenges and Opportunities: Case Studies Presented by WTO Chair-Holders*, edited by Marion Jansen, Mustapha Sadni Jallab, and Maarten Smeets, 25–41. World Trade Organization. https://www.wto.org/english/res_e/publications_e/connecting_markets_e.htm.

Armenia, Resty. 2015. "Jokowi Larang Ekspor Rumput Laut Mentah Mulai 2018." *CNN Indonesia*, April 14. http://www.cnnindonesia.com/ekonomi/20150414085734-92-46428/jokowi-larang-ekspor-rumput-laut-mentah-mulai-2018/.

Aslan, La Ode M., Wa Iba, La Ode Ridwan Bolu, Brett A. Ingram, Geoff. J. Gooley, and Sena S. de Silva. 2015. "Mariculture in SE Sulawesi, Indonesia: Culture Practices and the Socio Economic Aspects of the Major Commodities." *Ocean & Coastal Management* 116. Elsevier Ltd: 44–57.

Badan Pusat Statistik Provinsi Nusa Tenggara Barat (BPS-NTB). 2015. "Statistik Social Dan Kependudukan."

Bair, Jennifer. 2008. "Global Commodity Chains: Genealogy and Review." In *Frontiers of Commodity Chain Research*, edited by Jennifer Bair, 1–34. Stanford, CA: Stanford University Press.

Balai Budidaya Laut Lombok (BBL). 2012. *Petunjuk Teknis Budidaya Rumput Laut*.

Baweja, Pooja, Dinabandhu Sahoo, Pilar García-Jiménez, and Rafael R. Robaina. 2009. "Review: Seaweed Tissue Culture as Applied to Biotechnology: Problems, Achievements and Prospects." *Phycological Research* 57 (1): 45–58.

Belton, Ben. 2010. "The Social Relations of Aquaculture Development in South and Southeast Asia." *PhD Thesis*, 215.

Béné, Christophe, Robert Arthur, Hannah Norbury, Edward H. Allison, Malcolm Beveridge, Simon Bush, Liam Campling, et al. 2016. "Contribution of Fisheries and Aquaculture to Food Security and Poverty Reduction: Assessing the Current Evidence." *World Development* 79. Elsevier Ltd: 177–96.

Beveridge, Malcolm, Michael Phillips, Patrick Dugan, and Randy Brummet. 2010. "Barriers to Aquaculture Development as a Pathway to Poverty Alleviation and Food Security." *Proceedings of the Workshop on Advancing the Aquaculture Agenda, 12-16 April 2010, Paris, France.*, 345–59.

Bixler, Harris J., and Hans Porse. 2011. "A Decade of Change in the Seaweed Hydrocolloids Industry." *Journal of Applied Phycology* 23 (3): 321–35.

Bolwig, Simon, Stefano Ponte, Andries Toit, and Niels Halberg. 2010. "Integrating Poverty and Environmental Concerns into Value-Chain Analysis A Conceptual Framework." *Development Policy Review* 28 (2): 173–94.

Cai, J, N Hishamunda, and N Ridler. 2013. *Social and Economic Dimensions of Carrageenan Seaweed Farming: A Global Synthesis*. *Fisheries and Aquaculture Technical Paper No.580.Rome, FAO. 204 Pp.*

CBI. 2015. "CBI Product Factsheet: Carrageenan in Europe." CBI Ministry of Foreign Affairs.

Cook, Ian, and et al. 2004. "Follow the Thing: Papaya." *Antipode* 36: 642–64.

Coordinating Ministry for Economic Affairs (CMEA). 2011. *Acceleration and Expansion of Indonesia Economic Development 2011-2025*. Republic of Indonesia.

Crawford, Brian. 2002. *Seaweed Farming: An Alternative Livelihood for Small-Scale Fishers?* http://imcafs.org/download/Alt_Livelihood.pdf.
Creswell, John W. 2007. *Qualitative Inquiry & Research Design : Choosing among Five Approaches*. Edited by John W Creswell. *Qualitative Inquiry and Research Design*. 2nd ed.. Thousand Oaks: Thousand Oaks : Sage Publications.
Danzer, Erick M. 2008. "From Farmers to Global Markets: The Politics of Commodity Supply Chains in Indonesia." University of Wisconsin-Madison.
Darmawan, Muhamad, Bagus Sediadi, Bandol Utomo, Raekal Amral, and Yuda Mulia. 2013. "The Quality of Alkali Treated Cottonii (ATC) Made from Eucheuma Cottonii Collected from Different Regions In Indonesia." *Squalen Bulletin of Marine & Fisheries Postharvest & Biotechnology* 8 (3): 117–27.
Dávila, Karina Machado. 2013. "Seaweed Value Chain Upgrading: A Tool for Improving the Livelihoods for Women in Jambiani, Zanzibar." Ardhi University, Dar es Salaam, Tanzania.
De Marchi, Valentina, Eleonora Di Maria, and Stefano Micelli. 2013. "Environmental Strategies, Upgrading and Competitive Advantage in Global Value Chains." *Business Strategy and the Environment* 22 (1): 62–72.
Development Alternatives Inc. (DAI). 2011. *Agribusiness Market And Support Activity (AMARTA) Final Report*.
Dewi, Eko Nurcahya, Y.S. Darmanto, and Ambariyanto. 2012. "Characterization and Quality of Semi Refined Carrageenan (SCR) Products from Different Coastal Waters Based on Fourier Transform Infrared Technique." *Journal of Coastal Development* 16 (1): 25–31.
Dinas Kelautan dan Perikanan Nusa Tenggara Barat (DKP-NTB). 2013. *Data Statistik Perikanan Budidaya*. Mataram, Indonesia.
Dinas Perikanan dan Kelautan Kabupaten Lombok Timur (DPK-LT). 2013. "Potensi Produksi Perikanan Menurut Kecamatan." Selong, Nusa Tenggara Barat, Indonesia: Badan Pusat Statistik Kabupaten Lombok Timur.
FAO. 2016. "Fisheries and Aquaculture Software. FishStatJ - Software for Fishery Statistical Time Series." Rome. http://www.fao.org/fishery/statistics/software/fishstatj/en.
Fougères, Dorian. 2008. *Aquarian Capitalism and Transition in Indonesia*. Saarbrücken: VDM Verlag Dr. Müller.
Friedland. 1984. "Commodity Systems Analysis: An Approach to the Sociology of Agriculture." In *Research in Rural Sociology and Development*, edited by H. K. Schwarzweller, 221–35. Greenwich, CT: JAI Press Inc.
Fuji. 2016. "Personal Interview."
Garcia-Jimenez, P, and R R Robaina. 2015. "On Reproduction in Red Algae: Further Research Needed at the Molecular Level." *Front Plant Sci* 6 (February): 93.
Gellert, Paul K. 2003. "Renegotiating a Timber Commodity Chain: Lessons from Indonesia on the Political Construction of Global Commodity Chains." *Sociological Forum* 18 (1): 53–84.
Gereffi, Gary. 1999. "International Trade and Industrial Upgrading in the Apparel Commodity Chain." *Journal of International Economics* 48 (1): 37–70.
Gereffi, Gary. 2014. "Global Value Chains in a Post-Washington Consensus World." *Review of International Political Economy* 21 (April 2015): 9–37.
Gereffi, Gary. 1995. "Global Production Systems and Third World Development." In *Global Change, Regional Response: The New International Context of Development*, edited by B. Stallings, 100–142. New York: Cambridge University Press.
Gereffi, Gary. 1994. "The Organization of Buyer-Driven Global Commodity Chains: How US Retailers Shape Overseas Production Networks." In *Commodity Chains and Global Capitalism*, edited by Gary Gereffi and Miguel Korzeniewicz, 95–133. Westport, Conn.: Greenwood Press.

Gereffi, Gary, John Humphrey, and Timothy Sturgeon. 2005. "The Governance of Global Value Chains." *Review of International Political Economy* 12 (March 2015): 78–104.
Glienmourinsie, Disfiyant. 2016. "ARLI Ajukan Surat Sanggahan Ke AS Soal Olahan Rumput Laut." *SindoNews*, September 3. http://ekbis.sindonews.com/read/1136425/34/arli-ajukan-surat-sanggahan-ke-as-soal-olahan-rumput-laut-1472895641.
Guiry, M.D., and G.M. Guiry. 2016. "AlgaeBase." *National University of Ireland, Galway*. http://www.algaebase.org.
Haji. 2016. "Personal Interview."
Harrison-Dunn, Annie-Rose. 2015. "What Will It Take to Make Indonesian Seaweed Competitive?" *Food Navigator*, June 3. http://www.foodnavigator.com/Policy/What-will-it-take-to-make-Indonesian-seaweed-competitive.
Havice, Elizabeth, and Kristin Reed. 2012. "Fishing for Development? Tuna Resource Access and Industrial Change in Papua New Guinea." *Journal of Agrarian Change* 12 (2-3): 413–35.
Herianto, Ageng Setiawan, Peni Wastutinigsih, Derek Foster, Mike Rimmer, and Richard Callinan. 2010. "Agricultural and Fisheries Extension in Indonesia-Origins, Transitions and Current Challenges." *Extension Farming Systems Journal* 6 (1): 23. http://search.informit.com.au/documentSummary;dn=478831077007244;res=IELHSS.
Hill, Nicholas a O, J. Marcus Rowcliffe, Heather J. Koldewey, and E. J. Milner-Gulland. 2012. "The Interaction between Seaweed Farming as an Alternative Occupation and Fisher Numbers in the Central Philippines." *Conservation Biology* 26 (2): 324–34.
Hishamunda, Nathanael, Pedro B. Bueno, Niel RIder, and Wilfredo G. Yap. 2009. *Analysis of Aquaculture Development in Southeast Asia: FAO Fisheries and Aquaculture Technical Paper*. Rome: Food and Agriculture Organization of the United Nations.
Hishamunda, Nathanael, and Neil B. Ridler. 2006. "Farming Fish for Profits: A Small Step towards Food Security in Sub-Saharan Africa." *Food Policy* 31: 401–14.
Humphrey, John, and Hubert Schmitz. 2001. "Governance in Global Value Chains." *IDS Bulletin* 32 (3). University of Sussex, Brighton BN1 9RE, UK: 19–29.
Humphrey, John, and Hubert Schmitz. 2004. "Chain Governance and Upgrading: Taking Stock." In *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*, edited by Hubert Schmitz, 349–81. Cheltenham: Edward Elgar.
Hurtado, Anicia Q., Grevo S. Gerung, Suhaimi Yasir, and Alan T. Critchley. 2013. "Cultivation of Tropical Red Seaweeds in the BIMP-EAGA Region." *Journal of Applied Phycology* 26 (2): 707–18.
IFC. 2006. "Seaweed Forming in Indonesia." *Monitor*, October.
Islam, Md Saidul. 2008. "From Pond to Plate: Towards a Twin-Driven Commodity Chain in Bangladesh Shrimp Aquaculture." *Food Policy* 33 (3): 209–23.
Islam, Md Saidul. 2014. *Confronting the Blue Revolution - Industrial Aquaculture and Sustainability in the Global South*. Toronto.
Jacinto Jr., Esebio R., and Robert S. Pomeroy. 2011. "Developing Markets for Small-Scale Fisheries: Utilizing the Value Chain Approach." In *Small-Scale Fisheries Management: Frameworks and Approaches for the Developing World*, edited by Robert S. Pomeroy and Neil L Andrew, 160 – . Cambridge, Massachusetts: CAB International.
Jacinto Jr., Eusebio R. 2004. "A Research Framework on Value Chain Analysis in Small Scale Fisheries." *Lundayan Journal* 5. Quezon City, Philippines: 41–61.
Jespersen, Karen Sau, Ingrid Kelling, Stefano Ponte, and Froukje Kruijssen. 2014. "What Shapes Food Value Chains? Lessons from Aquaculture in Asia." *Food Policy* 49. Elsevier Ltd: 228–40.
Kaplinsky, Raphael, and Mike Morris. 2001. *A Handbook for Value Chain Research*. Brighton.
Karnan. 2016. "Personal Interview."

Katadata. 2016. “4 Kiat Menteri Susi Kembangkan Rumput Laut.” *Katadata*, March 1. http://katadata.co.id/infografik/2016/03/01/4-kiat-menteri-susi-kembangkan-rumput-laut.
Kementerian Kelautan dan Perikanan (KKP). 2014. *Data Pokok Kelautan Dan Perikanan*. Jakarta.
Kementerian Kelautan dan Perikanan (KKP). 2012. *Kebijakan Ekonomi Kelautan Dengan Model Ekonomi Biru*. Jakarta.
Kementerian Kelautan dan Perikanan (KKP). 2013. *Pengembangan Kawasan Minapolitan*. Jakarta.
Kementerian Kelautan dan Perikanan (KKP). 2015. “Komoditas Rumput Laut Kian Strategis.” Jakarta: Kementerian Kelautan Dan Perikanan Republik Indonesia. http://kkp.go.id/index.php/pers/komoditas-rumput-laut-kian-strategis/.
KickNews. 2016. “NTB Masuk Dalam ‘Road Map’ Rumput Laut Nasional.” *KickNews Today*, March 24. http://kicknews.today/2016/03/24/ntb-masuk-dalam-road-map-rumput-laut-nasional/.
Kompas. 2015. “Budidaya Laut Belum Optimal.” *Kompas*, April 2. http://print.kompas.com/baca/regional/nusantara/2015/04/01/Budidaya-Laut-Belum-Optimal.
Krishnan, M, and R Narayanakumar. 2010. “Structure, Conduct and Performance of Value Chain in Seaweed Farming in India.” *Agricultural Economics Research Review* 23: 505–14.
Krivka, Algirdas. 2016. “On the Concept of Market Concentration, the Minimum Herfindahl–Hirschman Index, and Its Practical Application.” *Panoeconomicus* 63 (5): 525–40.
Kusumawati, Rini, Simon R Bush, and Leontine E Visser. 2013. “Can Patrons Be Bypassed? Frictions between Local and Global Regulatory Networks over Shrimp Aquaculture in East Kalimantan.” *Society & Natural Resources* 26 (August 2015): 898–911.
LEI Wageningen UR. 2012. *The Indonesian Seafood Sector: A Value Chain Analysis*. http://www.wageningenur.nl/web/file?uuid=db48ac29-94c8-4703-92dd-b6058d3136f8&owner=33ffbb82-a2ec-48c8-a5c8-874c81663368.
Lim, Guanie. 2015. “Value Chain Upgrading: Evidence from the Singaporean Aquaculture Industry.” *Marine Policy* 63. Elsevier: 191–97.
Little, D C, B K Barman, B Belton, M C Beveridge, S J Bush, L Dabaddie, H Demaine, et al. 2012. “Alleviating Poverty through Aquaculture: Progress, Opportunities and Improvements.” In *Farming the Waters for People and Food. Proceedings of the Global Conference on Aquaculture 2010. 22–25 September\r2010*, 1:719–83.
Majid Cooke, Fadzilah. 2004. “Symbolic and Social Dimensions in the Economic Production of Seaweed.” *Asia Pacific Viewpoint* 45 (3): 387–400.
McCarthy, John F. 2007. “Sold down the River: Renegotiating Public Power over Nature in Central Kalimantan.” In *Renegotiating Boundaries: Local Politics in Post-Suharto Indonesia*, edited by Henk Schulte Nordholt and Gerry van Klinken, 151–76. Leiden: KITLV Press.
McHugh, Dennis J. 2003. *A Guide to the Seaweed Industry. FAO Fisheries Technical Paper*.
Moron, Vincent, Andrew W Robertson, and Jian-hua Qian. 2010. “Local versus Regional-Scale Characteristics of Monsoon Onset and Post-Onset Rainfall over Indonesia.” *Climate Dynamics* 34: 281–99.
Mosse, David. 2004. *Cultivating Development: An Ethnography of Aid Policy and Practice*. United Kingdom: Pluto Press.
Mulyati, Heti. 2015. “Supply Chain Risk Management Study of the Indonesian Seaweed Industry.”
Myers, Rodd. 2015. “What the Indonesian Rattan Export Ban Means for Domestic and International Markets, Forests, and the Livelihoods of Rattan Collectors.” *Forest Policy and Economics* 50. Elsevier B.V.: 210–19.
Neilson, Jeff, and Felicity Shonk. 2014. “Chained to Development? Livelihoods and Global Value Chains in the Coffee-Producing Toraja Region of Indonesia.” *Australian Geographer* 45 (February 2015): 269–88.
Neilson, Jeffrey. 2014. “Value Chains, Neoliberalism and Development Practice: The Indonesian Experience.” *Review of International Political Economy* 21 (April 2015): 38–69.

Neish, Iain C. 2008. “Structure and Development of Tropical Red Seaweed Value Chains.” *SEAPlant. Net Monograph No. HB2A*, 1–47. http://www.seaplant.net/bimpeaga/images/downloads/SPNF_HB2A_1108__V2_VC.pdf.
Neish, Iain C. 2013. “Socio-Economic Dimensions of Seaweed Farming in Indonesia : Full Version” 62 (411).
Neish, Iain C. 2007. *Assessment of the Seaweed Value Chain in Indonesia*.
Nurfauzi, Faris. 2016. “Personal Interview.”
OECD, WTO, and UNCTAD. 2013. *Implications of Global Value Chains for Trade, Investment, Development and Jobs*. *Proceedings of the G-20 Leaders Summit*. Paris.
Pareja. 2016. “Personal Interview.”
Patima, Haja. 2016. “Personal Interview.”
Patutie, Rahmat. 2015. “KKP Minta Investor Buka Pabrik Rumput Laut Di Indonesia.” *Tribun News*, May 21. http://www.tribunnews.com/bisnis/2015/05/21/kkp-minta-investor-buka-pabrik-rumput-laut-di-indonesia.
Peet, Richard, and Elaine Hartwick. 2009. *Theories of Development: Contentions, Arguments, Alternatives*. Second. New York, NY: The Guilford Press.
Ponte, Stefano, Ingrid Kelling, Karen Sau Jespersen, and Froukje Kruijssen. 2014. “The Blue Revolution in Asia: Upgrading and Governance in Aquaculture Value Chains.” *World Development* 64. Elsevier Ltd: 52–64.
Raissa, Devina Rahma, Rulli Pratiwi Setiawan, and Dian Rahmawati. 2014. “Identification of Indicators Influencing Sustainability of Minapolitan Area in Lamongan Regency.” *Procedia - Social and Behavioral Sciences* 135. Elsevier B.V.: 167–71.
Ravenhill, John. 2014. “Global Value Chains and Development.” *Review of International Political Economy* 21 (1). Taylor & Francis: 264–74.
Raynolds, Laura T. 2004. “The Globalization of Organic Agro-Food Networks.” *World Development* 32 (5): 725–43.
Reddy, C. R K, Bhavanath Jha, Yuji Fujita, and Masao Ohno. 2008. “Seaweed Micropropagation Techniques and Their Potentials: An Overview.” *Journal of Applied Phycology* 20 (5): 609–17.
Ribot, Jesse C. 1998. “Theorizing Access: Forest Profits along Senegal’s Charcoal Commodity Chain.” *Development and Change* 29: 307–41.
Ribot, Jesse C., and Nancy Lee Peluso. 2003. “A Theory of Access.” *Rural Sociology* 68 (2): 153–81. papers2://publication/uuid/E2E24243-C59C-462F-BBC9-CF1E8503E761.
Riisgaard, Lone, Simon Bolwig, Stefano Ponte, Andries du Toit, Niels Halberg, and Frank Matose. 2010. “Integrating Poverty and Environmental Concerns into Value-Chain Analysis: A Strategic Framework and Practical Guide.” *Development Policy Review* 28 (2): 195–216.
Rossi, Arianna. 2013. “Does Economic Upgrading Lead to Social Upgrading in Global Production Networks? Evidence from Morocco.” *World Development* 46. Elsevier Ltd: 223–33.
Rusman, Ujang Komarudin, and Supriadi. 2013. *Aklimatisasi Bibit Rumput Laut Kotoni (Kappaphycus Alvarezii) Hasil Kultur Jaringan Di Perairan Teluk Gerupuk Kabupaten Lombok Tengah*.
Rutherford, Donald. 2013. *Routledge Dictionary of Economics*. Third. Oxon, England: Routledge.
Saharudin. 2016. “Personal Interview.”
Sahat, Hendro Jonathan. 2013. “Warta Ekspor: Rumput Laut Indonesia.” Jakarta: Kementerian Perdagangan Republik Indonesia. http://swa.co.id/business-strategy/rumput-laut-indonesia-rambah-eropa.
Saldaña, Johnny. 2012. *The Coding Manual for Qualitative Researchers*. 2nd ed. London: SAGE Publications.
Sekretariat Program Unggulan Nusa Tenggara Barat (SPU-NTB). 2016. “Arti Strategis: Mengapa Rumput Laut NTB Perlu Dikembangkan?” http://programunggulan.ntbprov.go.id/agribisnis-rumput-laut/arti-strategis/.

Sen, Amartya. 1999. *Development as Freedom*. New York: Alfred A. Knopf.
Setboonsarng, Sununtar, and PingSun Leung, eds. 2014. *Making Globalization Work Better for the Poor through Contract Farming*. Mandaluyong City, Philippines: Asian Development Bank.
Siar, Susana V, William Lee Johnston, and Sih Yang Sim. 2002. *Study on Economics and Socio-Economics of Small-Scale Marine Fish Hatcheries and Nurseries, with Special Reference to Grouper Systems in Bali, Indonesia*. Bangkok, Thailand.
Siegner, Cathy. 2016. "Board Nixes Use of Carrageenan in Organic Food Production." *Food Safety News*, November 18. http://www.foodsafetynews.com/2016/11/board-nixes-use-of-carrageenan-in-organic-food-production/#.WJfSqWP57Og.
Sievanen, Leila, Brian Crawford, Richard B. Pollnac, and Celia Lowe. 2005. "Weeding through Assumptions of Livelihood Approaches in {ICM}: Seaweed Farming in the Philippines and Indonesia." *Ocean & Coastal Management* 48 (3-6): 297–313.
Silva, Paul C, Philip W Basson, and Richard Lee Moe. 1996. "Catalogue of the Benthic Marine Algae of the Indian Ocean." *University of California Publications in Botany* 79. Berkeley: Berkeley : University of California Press: 1–1259.
Silver, J. J., N. J. Gray, L. M. Campbell, L. W. Fairbanks, and R. L. Gruby. 2015. "Blue Economy and Competing Discourses in International Oceans Governance." *The Journal of Environment & Development* 24 (2): 135–60.
Soesilo, Indroyono. 2014. "Blue Economy for Marine Resource Development." *The Jakarta Post*, March 20. http://www.thejakartapost.com/news/2014/03/20/blue-economy-marine-resource-development.html.
Sunaryanto, Anto, and Reza Shah Pahlevi. 2008. "Strategy for the Empowerment of Aquaculture Fish Farmers in Indonesia." In *Poverty Reduction Through Sustainable Fisheries*, edited by Roehlano M. Briones and Arnulfo G. Garcia, 276. Singapore: Institute of Southeast Asian Studies.
Tran, Nhuong, Conner Bailey, Norbert Wilson, and Michael Phillips. 2013. "Governance of Global Value Chains in Response to Food Safety and Certification Standards: The Case of Shrimp from Vietnam." *World Development* 45 (202374). Elsevier Ltd: 325–36.
U.S. Department of Justice and Federal Trade Commission (U.S. DOJ and FTC). 1997. "Horizontal Merger Guidelines." https://www.justice.gov/atr/horizontal-merger-guidelines.
UNCTAD. 2013. *World Investment Report 2013*. unctad.org/en/PublicationsLibrary/wir2013_en.pdf.
United Nations. 2016. "UN Comtrade Database." United Nations Statistics Division, Trade Statistics Branch. http://comtrade.un.org/data/.
USAID. 2012. *The Blue Economy Indonesia*. http://www.imacsindonesia.com/v5/index.php/en/2012-08-06-16-21-25/policies/blue-economy.
Valderrama, Diego, Junning Cai, Nathanael Hishamunda, Neil Ridler, Iain C. Neish, Anicia Q. Hurtado, Flower E. Msuya, et al. 2015. "The Economics of *Kappaphycus* Seaweed Cultivation in Developing Countries: A Comparative Analysis of Farming Systems." *Aquaculture Economics & Management* 19 (May): 251–77.
Werner, Marion, Jennifer Bair, and Victor Ramiro Fernández. 2014. "Linking Up to Development? Global Value Chains and the Making of a Post-Washington Consensus." *Development and Change* 45 (6): 1219–47.
Wiadnya, Dewa Gede Raka. 2011. *Konsep Perencanaan Minapolitan Dalam Pengembangan Wilayah*. Malang, Indonesia.
Widyastuti, Sri. 2010. "Sifat Fisik Dan Kimiawi Karagenan Yang Diekstrak Dari Rumput Laut Eucheuma Cottonii Dan E. Spinosum Pada Umur Yang Berbeda." *Agroteksos* 20 (1): 41–50.
Wie, Thee Kian. 2002. "The Soeharto Era and after: Stability, Development and Crisis, 1966-2000." In *The Emergence of a National Economy: An Economic History of Indonesia, 1800-2000*, 194–243. Honolulu, Hawai'i: University of Hawai'i Press.

Wie, Thee Kian. 2012. *Indonesia's Economy since Independence*. Singapore: Singapore : Institute of Southeast Asian Studies.

Yusuf, Dedi. 1995. "Aquaculture in Indonesia." In *Seminar-Workshop on Aquaculture Development in Southeast Asia, Iloilo City, Philippines, 26-28 July, 1994*, 109–15. Tigbauan, Iloilo, Philippines: Aquaculture Dept., Southeast Asian Fisheries Development Center.

Zamroni, Achmad, and Masahiro Yamao. 2011. "Coastal Resource Management: Fishermen's Perceptions of Seaweed Farming in Indonesia." *World Academy of Science, Engineering and Technology* 5 (12): 32–38.

Zatnika, A., and Sri Istini. 1985. "Produksi Rumput Laut Dan Pemasarannya Di Indonesia." In *Seafarming Workshop Report, Bandar Lampung, 28 October - 1 November 1985*.

Zhou, W. 2003. *Report Technical Assistance to the Republic of Indonesia for Preparing the Sustainable Aquaculture Development for Food Security and Poverty Reduction Project*.